TOOLING & PRODUCTION Magazine

MAY 1958

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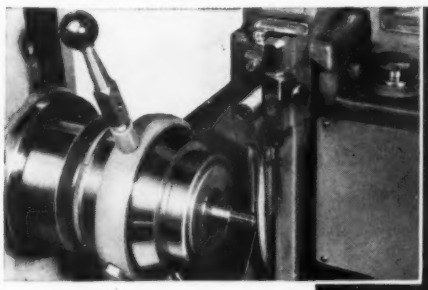
R. J. Rahn,
Developer of
the Planekator

See page 69 for
CAN YOU PROVE (?) THE FLATNESS (?) OF YOUR FLAT (?) SURFACE PLATES?

Rotating or non-rotating

performs equally well!



Accuracy obtained on this thread grinding operation eliminated need of holding between centers.

Tapping to extremely close tolerances on a difficult job.

All users are unanimous in reporting the all-purpose value of the Levermatic. Not only is it *accurate* and *fast*, but it is exceedingly *versatile*. In fact, jobs that are turned or faced can be threaded or milled without removal from the chuck.

The Levermatic provides *instant* internal and external gripping and releasing (with no stopping of spindle on bar or arbor work)! Faster, more accurate machining at lower costs! For every type of standard and special machine.

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Learn how practical the Levermatic would be in your shop by seeing how other users have applied it to their jobs.

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Sutton Tool Company

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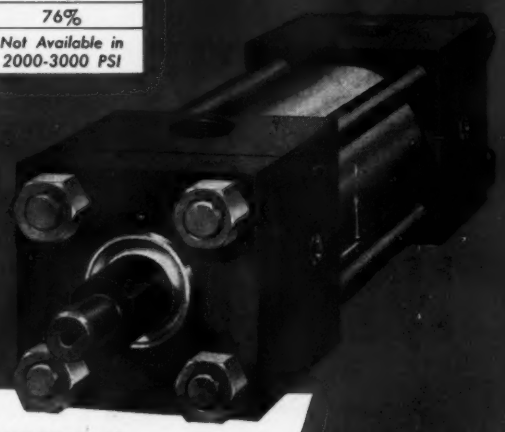
1½"	1500 PSI	2500 PSI	27%
2	1500	2500	27%
2½	1000	1500	28%
3¼	1500	2500	32%
4	1000	1500	35%
5	800	1200	37%
6	800	1200	43%
8	500	800	50%
10	500	800	71%
12	500	800	76%
14	500	800	*Not Available in 2000-3000 PSI*

with IDENTICAL seals, design, and safety factors as the famous Miller "Power-Packed" Model "H" Line for 3000-5000 psi service.



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1. *No seal made of synthetic rubber is compatible with even 50% of available, commercial, petroleum base hydraulic fluids.*

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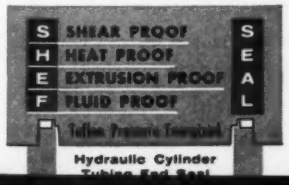
NOW! . . . You can save MORE with quality Miller "Job-Rated" Cylinders than with cut-price, lesser quality hydraulic cylinders. And the "Job-Rated" Cylinders are also available under the same immediate shipment program as the Power-Packed Line (2 hours if necessary—3 days normal).



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See your L&I Distributor now, or write for his name.

L&I

"the reamer specialists"

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

MAY 1958
VOL. XXIV—No. 2
GEORGE J. HUEBNER, Founder

PERSONALLY SPEAKING

Dear T&P Reader:

Recently Hughes Aircraft revealed to industry its new electronic control system, Digitape, which, through the machine tools it controls, accomplishes short run automation. Much has already appeared in the press describing this spectacular development. See the April 1958 issue of Tooling and Production for a good picture story of Digitape.

I had the privilege of being present when Digitape was first revealed to about one hundred representatives of the Press, Radio, and Television. The entire group was also given an opportunity to take a tour through the Hughes Aircraft El Segundo Plant. It is about this, I'd like to comment.

The El Segundo plant builds electronic control systems and through this operation Hughes has become one of the largest electronics manufacturers. The plant we saw was amazing for its mastery of the management of detail. Much of the work at El Segundo is the building of fire control systems for interceptor aircraft. This requires mass production, but of a different sort than usual. The mass is a multiplicity of different parts in relatively small quantities of each. And it was the obvious smoothness with which production was achieved, parts inventories managed and assembly accomplished that impressed me. It's no wonder that Hughes Aircraft has grown from a start with 700 employees 8 or 10 years ago to over 35,000 today. It's also obvious why Hughes can do business with the armed forces and commercial customers alike on a fixed price basis.

El Segundo is a perfect example of what happens when you put together free enterprise and American ingenuity and engineering directed by a superior management. I'm well aware of the fact that there are many other well run plants in the U.S.A. Knowing this and having seen this Hughes operation makes me feel real good about our position in the continuing race for international supremacy.

Cordially yours,

Ray Huebner

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VR-77...VR-75...VR-73

for Machining Superalloys and ALL Types of Steel

Here are the answers to your problems when you need cutting materials with *shock resistance*, *wear resistance* and *high heat resistance* for machining the new superalloys and all kinds of steel!

With these three carbide grades you can cover the complete machining range. All three have been carefully developed through many years of experimenting, checking and testing. Each one has the correct balance of characteristics and physical properties to handle a specific range of operations. Now they're ready for you.

VR-77 for heavy roughing and interrupted cutting
VR-75 for medium roughing and general purpose machining
VR-73 for light roughing and finish machining

Complete information on all 14 V-R Standard Carbide Grades is shown in V-R Bulletin 5803. Write for your copy or call your local representative or distributor.

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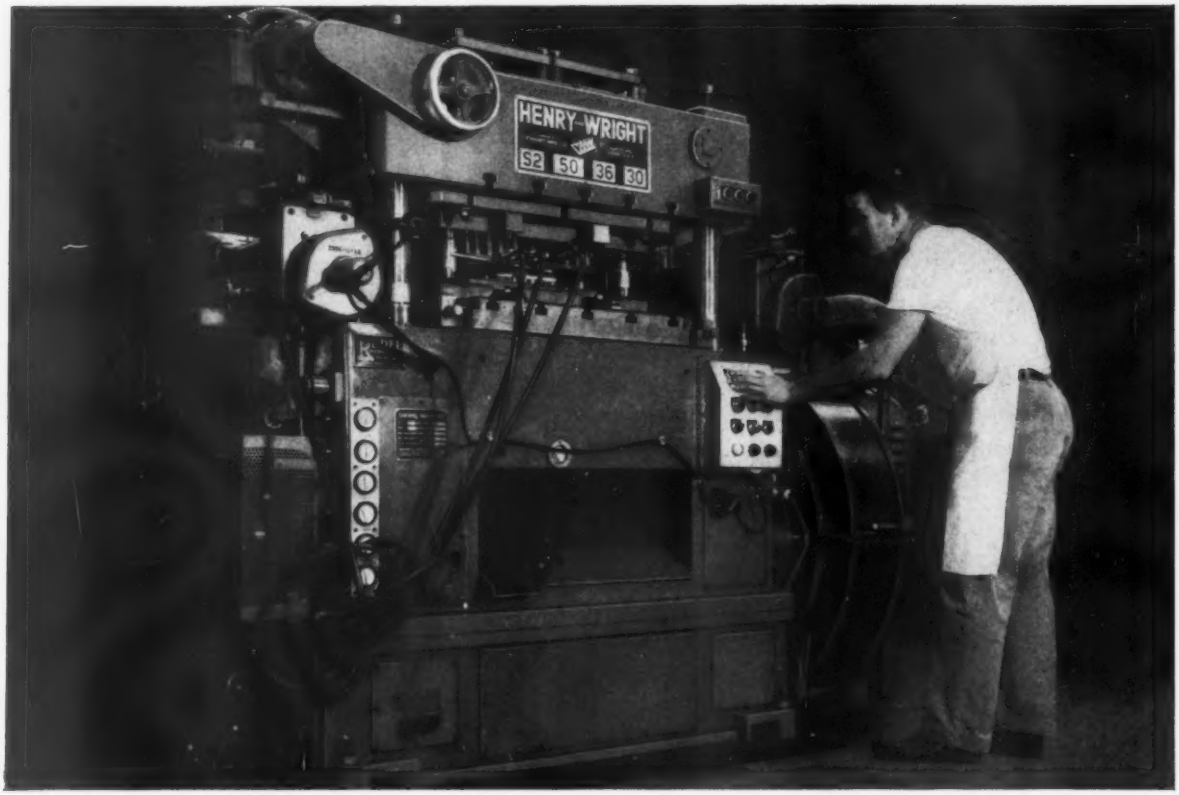
CIRCLE INFORM-A-GRAM KEY NO. 5

Another Outstanding Henry and Wright Installation . . .



Henry & Wright 50-ton Double Crank at Electric Typewriter Division, International Business Machines Corporation, Kingston, N. Y.

IBM took these steps to assure quality stamping methods

Assure quality and reduce problems inherent in separate operations by using progressive dies for key components . . . design dies so as to accommodate sub-dies for variations in a part's configuration . . . build each die to the highest standards of precision . . . use presses of exceptional accuracy to assure maximum die life.

Double Crank Henry & Wrights were selected for this program. The pay-off: 180,000 type bars produced between die grinds as against half that number with old dies on conventional press; 8,000 trip levers per hour on a Henry & Wright against 5,000 per hour by the previous method.

Operational benefits cited by IBM personnel included: after a year's use, Henry & Wrights retained parallelism-alignment within .0005"; front and back accessibility of machines reduces die set-up time; misfeeding of stock eliminated; feed length variation is negligible, thereby making adjustments unnecessary to compensate for changes in press speed; punch clamping is easier.

To be sure of the maximum pay-off for improved methods in your plant, investigate Henry & Wrights. Catalogs are yours for the asking.

Now, more than ever before, there's an H-P-M for your particular job. Write today for complete information. Make H-P-M your standard for metalworking press equipment.

HPM H&W H802

THE HYDRAULIC PRESS MFG. COMPANY

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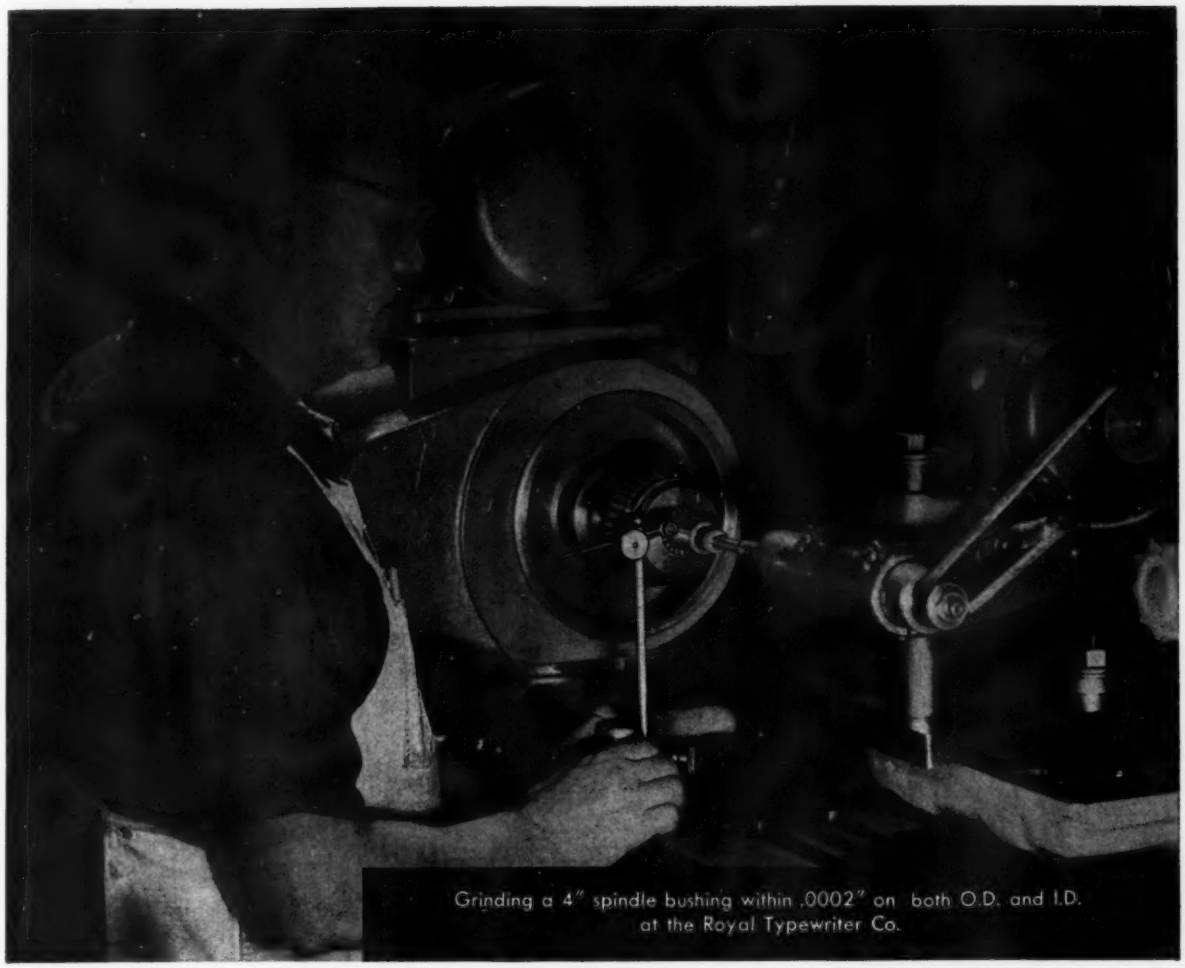
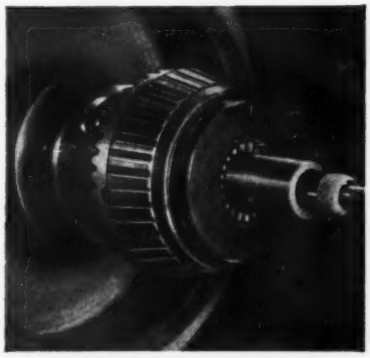


Grinding a 4" spindle bushing within .0002" on both O.D. and I.D. at the Royal Typewriter Co.

"This Jacobs Chuck has been in constant use for 4 years without repair or replacement"



This spindle bushing, ground to a tolerance of .0002" I.D. and O.D., will be used in a grinding head to grind typewriter escapement wheels. Exacting accuracy is essential.

Mr. Barclay Craigie grinds pieces with O.D. from 1/16" to 1 3/8" on a Brown and Sharpe No. 4 Universal Grinding Machine equipped with a Jacobs Key Type Rubber-Flex Collet Chuck. He is often required to maintain tolerances like the .0002" demanded inside and outside on this bushing. He says:

"I get all the accuracy I need. This chuck is a big timesaver—better for the operator and for the company. I have used it continually for 4 years without repair or replacement of collet."

You hold your work with the tightest, most accurate grip ever devised when you hold with the Jacobs Rubber-Flex Collet. Ask your industrial supply distributor for Bulletin 57-CC on the Model 96 Key Type Collet Chuck shown here and for Bulletin 57-LC on the Model 91 Hand Wheel Collet Chuck.

Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks . . . first in service.

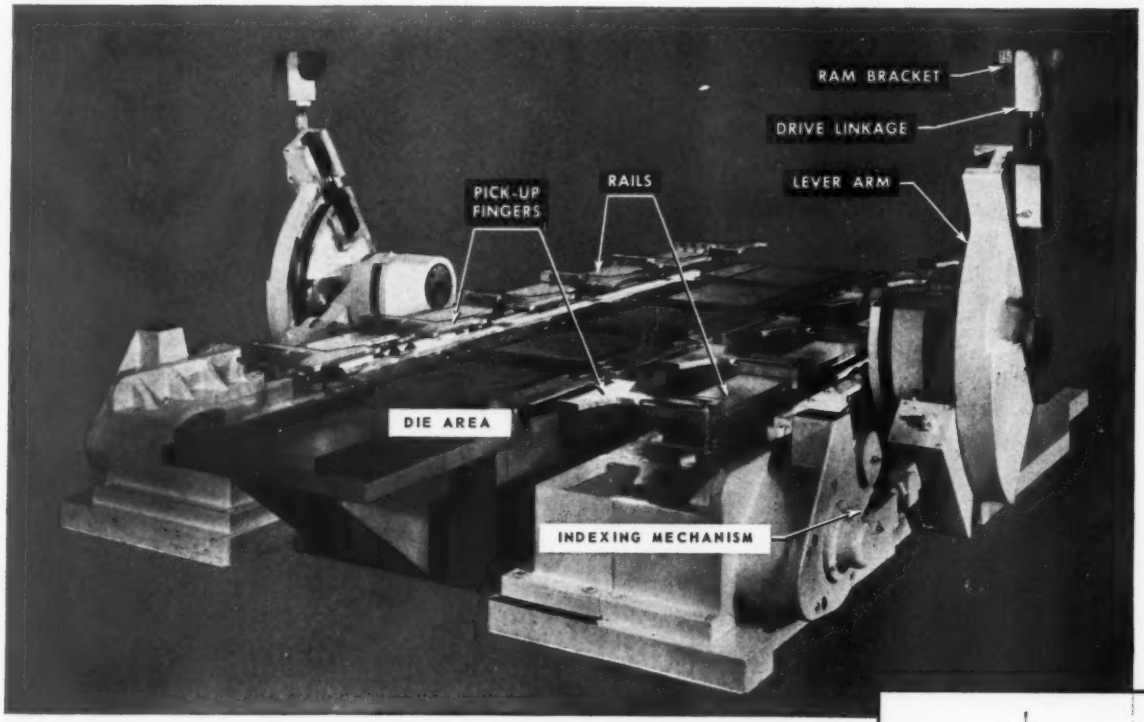
Jacobs CHUCKS

The Jacobs Manufacturing Company, West Hartford, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 7

SHEFFIELD ~~PRESS-PACERS~~

SUBSTANTIALLY INCREASE PRESS OUTPUT



The Sheffield Press-Pacers are all readily demountable transfer mechanisms used to automate one or a line of straight-side presses.

Any number of transfer operations within press capacity may be included. Thus, one press can be made to do the work of several.

Coil stock, blanks or pre-drawn work parts may be handled with equal facility.

OPERATION

The Press-Pacer receives the work and advances it from die to die and from press to press—all automatically.

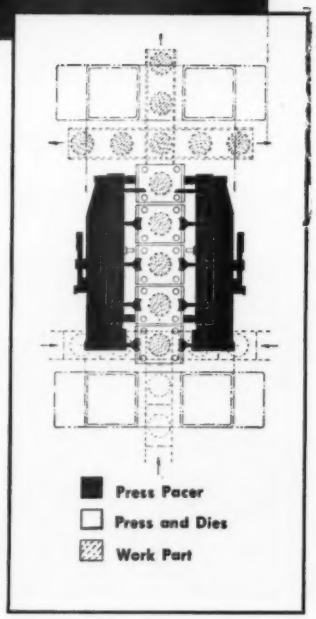
Work parts may be traversed in any desired direction—front to back, right to left or the reverse.

PRODUCT CHANGE DOES NOT OBSOLETE THE PRESS-PACER

Feed fingers are interchangeable and easily replaced when the product is changed. Traverse distance between dies and between presses is fully adjustable to changed requirements.

Installation of the Press-Pacer can be done in just a few hours. It may be removed from a press in a matter of minutes.

8005



Write for **Catalog No. PP3M-57 to the Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 20.**

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of Bendix Aviation
manufacture and measurement for mankind

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3/8" Capacity

"TOPS THEM ALL IN PERFORMANCE AND HANDLING," says large auto assembly plant.

"TORQUES IN 4 SECONDS COMPARED TO 8 SECONDS FOR OTHER WRENCHES," says appliance manufacturer.

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TIME SAVING. Delivers 1800 solid blows per minute.

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☐ Send literature and quotation.

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Company Address_____
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Position_____
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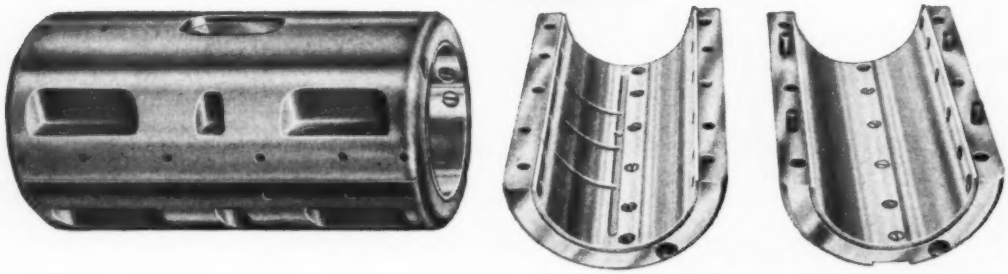
CIRCLE INFORM-A-GRAM KEY NO. 9

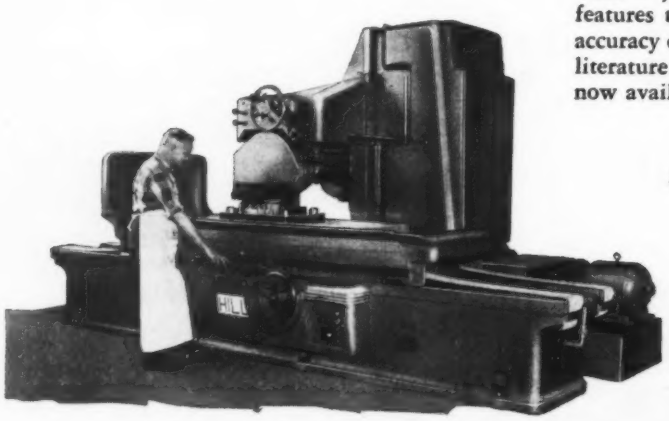
Novel Design provides *Astonishing Bearing Life*

The life of the HILL front spindle bearing on HILL horizontal spindle hydraulic surface grinders is truly astonishing. This bearing has been an *exclusive* HILL feature for more than 15 years. The necessity of replacement, under constant use, is practically unknown.



The front spindle bearing on HILL horizontal spindle hydraulic surface grinders was engineered by the HILL ACME COMPANY and has proven in the field to operate indefinitely. An alloy bronze bushing is fastened to a semi-steel casting with brass screws. The bronze bushing is undercut lengthwise in four equidistant locations on the outside diameter to allow for spindle expansion. (Darker areas in photo show undercut sections.) A perfect bearing surface is established in the I.D. of the bronze directly opposite the undercut sections. Oil is forced into specially designed concave relief areas which act as oil wedges assuring long bearing life. Hardened dowel pins guide the two halves together to their original position. The bottom half of the bearing has an oil return slot shown at the edge of the half section on the outside diameter. Note that there are NO oil grooves in this bottom half or in the quarter half of the top section. The shaft rotation spreads the oil film from the oil distribution grooves to the perfect bearing surfaces. Any additional oil grooves would act as scrapers and be detrimental to the oil film formed around the spindle.

This is just one of the many exclusive construction features that result in the longer life and permanent accuracy of HILL heavy duty surface grinders. Detailed literature on these high-precision machine tools is now available.



24" x 24" x 72" HILL horizontal spindle surface grinder grinding blanking dies to extremely close tolerances. Also built in Vertical Spindle design.

THE HILL ACME COMPANY

HILL DIVISION . . . . . ESTABLISHED 1882

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"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

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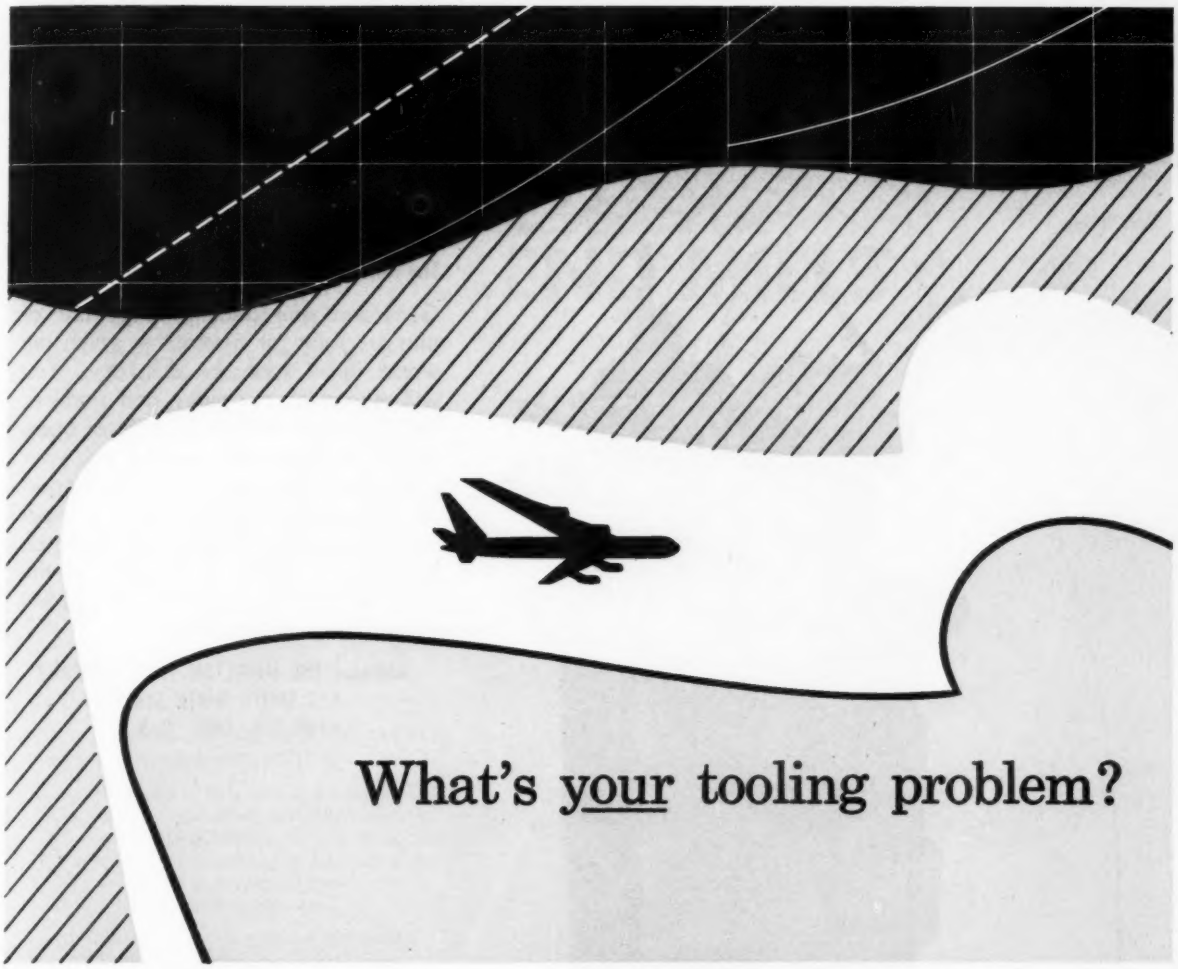

Your tooling resin formulator can help you with EPON® RESIN

The skill and knowledge of your tooling resin formulator combined with Shell Chemical's years of experience and technical research mean more profitable production for *you* with Epon resin tooling.

In addition to supplying basic tooling information, Shell Chemical also has developed extensive data on fillers, flexibilizers, curing agents, and diluents for your tooling resin formulator.

In many fields of industry, the unusual physical properties of tools made with Epon resin-based formulations make possible the saving of more than half the cost of fabricating a conventional tool.

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Outstanding strength. Tools with thin cross sections can be laminated with layers of glass cloth and Epon resin to achieve high flexural strength.

Can Epon resin help you with your tooling? Find out now by writing your tooling resin formulator. For a list of tooling resin formulators, write to Shell Chemical.

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2549

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Generates spur gears and pinions of plus-precision for assemblies which the world relies upon for accuracy. You will marvel at its *rigidity* and *stamina*, at its quiet efficiency and ease of operation. And you will want it for your own when you apprehend the import of its *important* feature No. 10 (independent selection of feed and indexing). Capacity — .050" to 2" O.D. of the gear blank. Free Bulletin No. 2549 provides full information.

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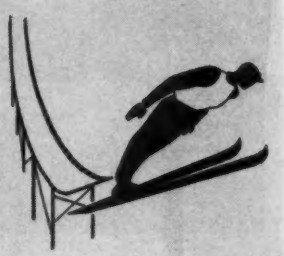
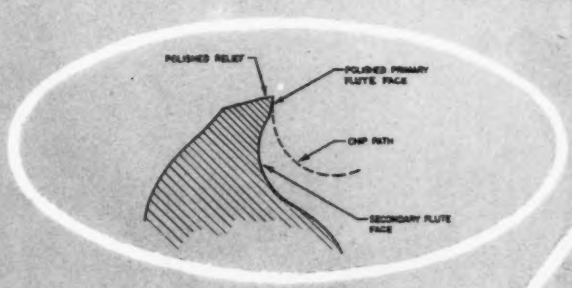
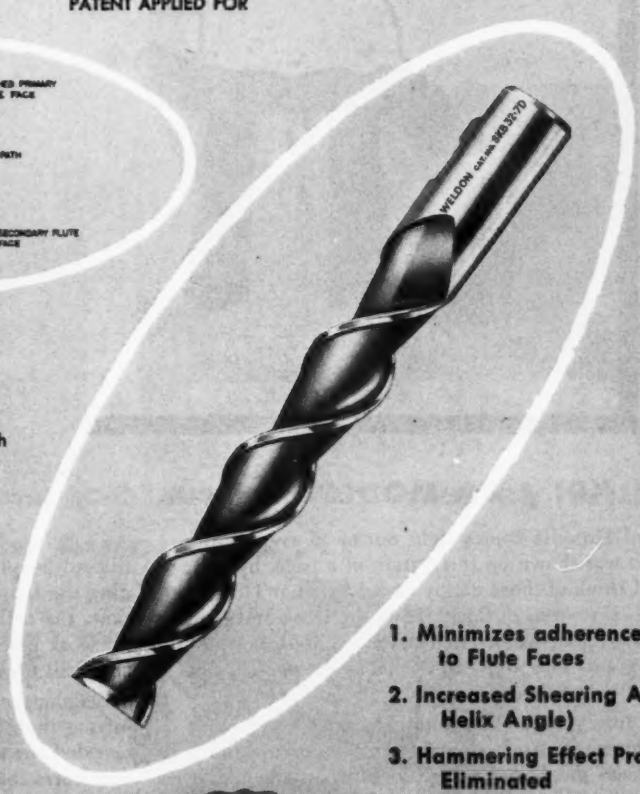
NEW! WELDON *Ski-Kut* END MILLS



FOR CUTTING ALUMINUM

PATENT APPLIED FOR





CUTTING ALUMINUM MADE EASIER, SMOOTHER AND FASTER

The primary flute face of the Ski-Kut End Mills, being narrow, definitely minimizes adherence of chips to the flute faces. Such adherence or welding of aluminum chips contributes in a major degree to the difficulty in milling aluminum.

Greater feeds, longer tool life, better finish, easier operation of equipment are some of the advantages to be gained by the use of Weldon Ski-Kut End Mills for cutting aluminum.

Weldon SKI-KUT End Mills are available from stock in size from 1/4" to 2" in various lengths. For full information write for folder SKM-1

A RADICALLY NEW DEVELOPMENT IN END MILL DESIGN FOR CUTTING ALUMINUM THAT SPEEDS PRODUCTION AND REDUCES COST.

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1. Minimizes adherence of Chips to Flute Faces
2. Increased Shearing Action(45° Helix Angle)
3. Hammering Effect Practically Eliminated
4. Greater Feeds
5. Longer Tool Life
6. Better Finish
7. Easier Operation

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you. SK3

THE WELDON TOOL COMPANY

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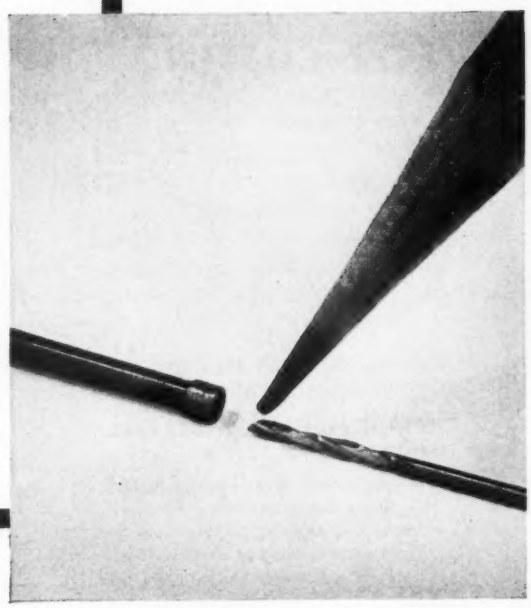
DROODLES

by ROGER PRICE

J&L



"PI A LA MODE"

This cool Droodle comes right out of an engineering textbook (it was drawn on the margin of a page, by me). Ah, when I think of those happy days I spent at Tolypec Polytech . . . seventeen of them! Then the Dean and I, in a heart-to-heart chat, decided that I'd better choose between Engineering and Droodles. It was a tough choice, but Art won out over Science.

Before I lose your attention entirely, I'd like to point out that engineering has been making strides even without my help. Take the J&L Comparator, for instance. This ingenious instrument measures and inspects all sorts of parts and objects, laterally, vertically and angularly – it also inspects by reflection and by tracing – speedily, and with precision (to .0001").

The photo above shows a tiny tube that presented a difficult inspection problem. There's a stepped hole running the length of this little piece. Three-quarters of the time, the drills would go right out through the sides of the work pieces. The resulting scrap rate was prohibitive, and drill breakage was high.

Staging the tiny drills on a J&L Comparator, and magnifying their shadows to fill the thirty-inch glass screen, revealed the cause of the trouble: some drills had slight curvatures that had previously gone undetected. This was immediately rectified, and production continued smoothly.

Do *you* have a difficult inspection problem? Jones & Lamson makes the Comparator in eleven models, ranging from a 7" Bench type to a 30" floor model. For complete details, send this coupon *today.*

"The originator of machine tool standards in optical inspection"

JONES & LAMSON

Floor Model FC-30

JONES & LAMSON MACHINE COMPANY, Dept. 710, 519 Clinton Street, Springfield, Vt., U.S.A.

Please send me Comparator Catalog 5700, which describes the complete line of J & L Optical Comparators.

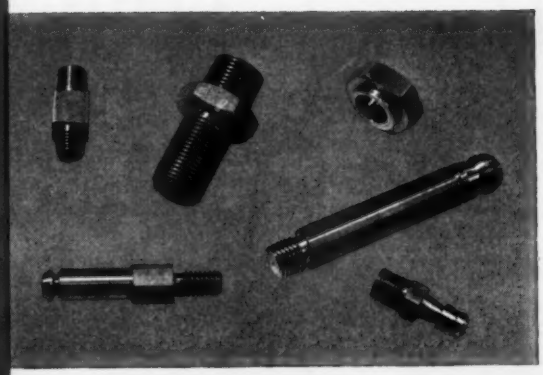
name _____ title _____ street _____

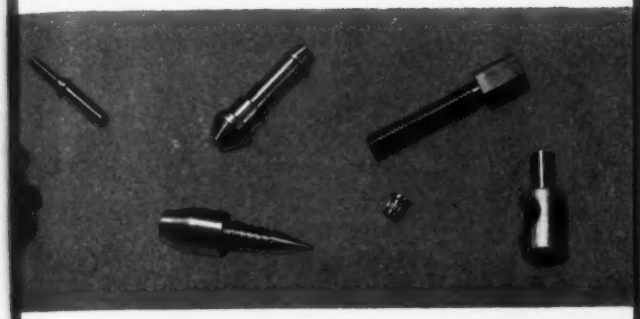
company _____ city _____ zone _____ state _____

385

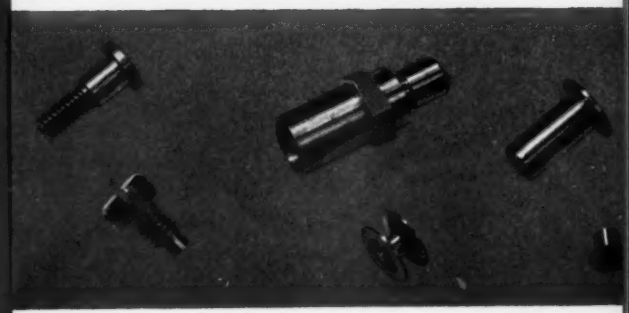
CIRCLE INFORM-A-GRAM KEY NO. 14

if you make parts like these . . .





or these



or these

you can do a better job and save money with a BSA Single Spindle Automatic . . .

BSA Single Spindle Automatic Screw Machines offer speeds, machining accuracy, ease of tooling and operation and low cost maintenance equal or superior to anything in their class. All these *plus* "unit construction and replacement" of work spindles, side slides, turrets and gear boxes. This means less machine down time—faster, more accurate production. National Acme provides full engineering and tool design services as well as service facilities and a full stock of replacement parts.

We would like to show you how BSA Single Spindle Automatics fit into your production picture. Write for free illustrated literature.

FIVE STANDARD CAPACITIES:
½", ¾", 1", 1½" and 2".
WIDE RANGE OF SPINDLE SPEEDS:
200 to 6000 on ½" machine.
69 to 1260 on 2" model.
All models use STANDARD AMERICAN TOOLING.

BSA Automatic Screw Machines are sold, stocked and serviced in the U.S.A. by

National Acme

THE NATIONAL ACME COMPANY, 169 E. 131st St., CLEVELAND 8, Ohio • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 15

How to be SURE about Surface Roughness

NO NEED TO GUESS or wonder about the roughness of parts that you make or buy. With the PROFILOMETER® at hand, you KNOW the roughness, because —

1 The Profilometer *measures* surface roughness in definite *microinch units* (arithmetical or r.m.s. average height). It eliminates the errors and uncertainties of inspection by touch or sight.

2 It is *accurate* and *dependable*—even below 3 microinches. Cannot be set to give wrong readings.

3 It's a sturdy, portable SHOP TOOL — as easy to use as a dial gage.

4 It is *versatile.* Measures almost *any* surface, internal or external, over any desired length. Measures plastics, glass, etc. as readily as metal.

5 It's been *thoroughly proven* in thousands of production and inspection departments — *since 1936.*

FREE ILLUSTRATED BULLETIN gives details; describes cost-saving applications. *Write for it!*

Representatives in principal industrial centers throughout the Free World

Profilometer is a registered trade-mark.

MMC® MICROMETRICAL MANUFACTURING COMPANY

389 S. MAIN ST. ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 16

Coming Events

May 1-8. American Society of Tool Engineers. 1958 Tool Show. Convention Center, Philadelphia.

•

May 6-9. American Society of Tool Engineers. Western Joint Computer Conference. Ambassador Hotel, Los Angeles.

•

May 8-9. Illinois Institute of Technology. Cost Reduction Conference. Illinois Institute of Technology, Chicago.

•

May 8-10. American Materials Handling Society. Second Western Regional Material Handling Show. Great Western Exhibit Center, Los Angeles.

•

May 11-14. Copper and Brass Research Association. Annual Meeting, Homestead, Hot Springs, Virginia.

•

May 12-14. American Management Association. General Management Conference. Commodore Hotel, New York.

•

May 12-16. The Southwestern Metal Exposition. State Fair Park, Dallas, Texas.

•

May 13-15. Investment Casting Institute. Spring Meeting. Edgewater Beach Hotel, Chicago.

•

May 15-16. National Industrial Conference Board, Inc. General Session and Annual Meeting. Waldorf-Astoria Hotel, New York.

•

May 19-21. National Association of Metal Finishers. Annual Meeting. Sheraton-Gibson Hotel, Cincinnati.

•

May 21-22. American Iron & Steel Institute. Annual Meeting. Waldorf-Astoria Hotel, New York.

•

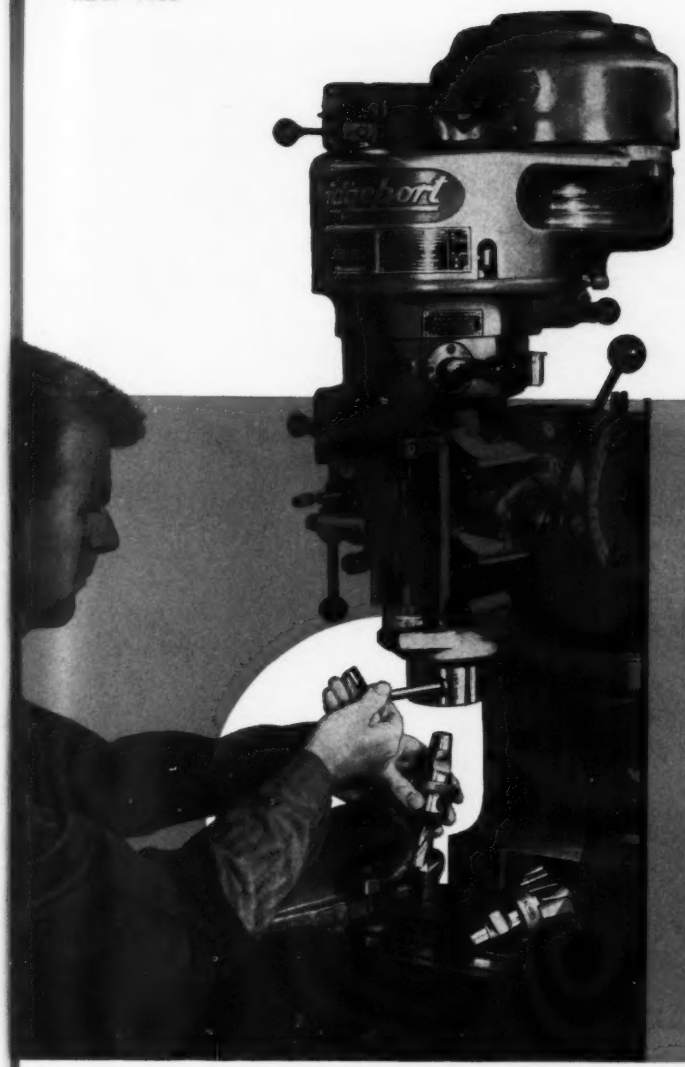
May 21-23. Electronic Industries Association. Annual Meeting. Sheraton Hotel, Chicago.

•

May 26-28. American Society for Quality Control. Annual Meeting. Statler Hotel, Boston.

•

May 27-28. Electronics Industries Association. Second EIA Conference on Maintainability of Electronic Equipment. University of Pennsylvania, Philadelphia.



now change tools in seconds on your Bridgeport milling machine!

NEW MICROBORE FLASH-CHANGE SPINDLE MAKES IT POSSIBLE

Custom designed for Bridgeport Model J Milling Heads, now available from stock.

Easily installed, the new Microbore spindle equips any Bridgeport for Microbore Flash-Change Tooling. This quick change system increases productivity and reduces downtime on all milling, drilling and boring operations.

The Flash-Change Socket, an integral part of the spindle, combines maximum strength and rigidity for roughing with extreme accuracy for precise finishing operations. A full range of standard Flash-Change Adapters for end mills, shell end mills, drills, drill chucks and one- or two-tool Standard Microbore Boring Bars is also available.

Return the attached coupon for complete information on another Microbore first!

DEVLIEG MICROBORE® SYSTEM

DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY

2720 West Fourteen Mile Rd., Royal Oak, Michigan

Please send me . . . ☐ **Complete information on the New Microbore Flash-Change Bridgeport Spindle**

☐ **Comprehensive Microbore Catalog**

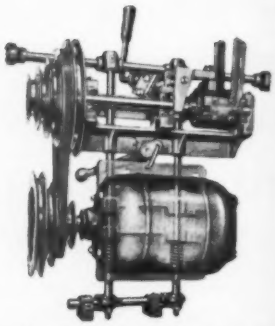
NAME

COMPANY

TITLE

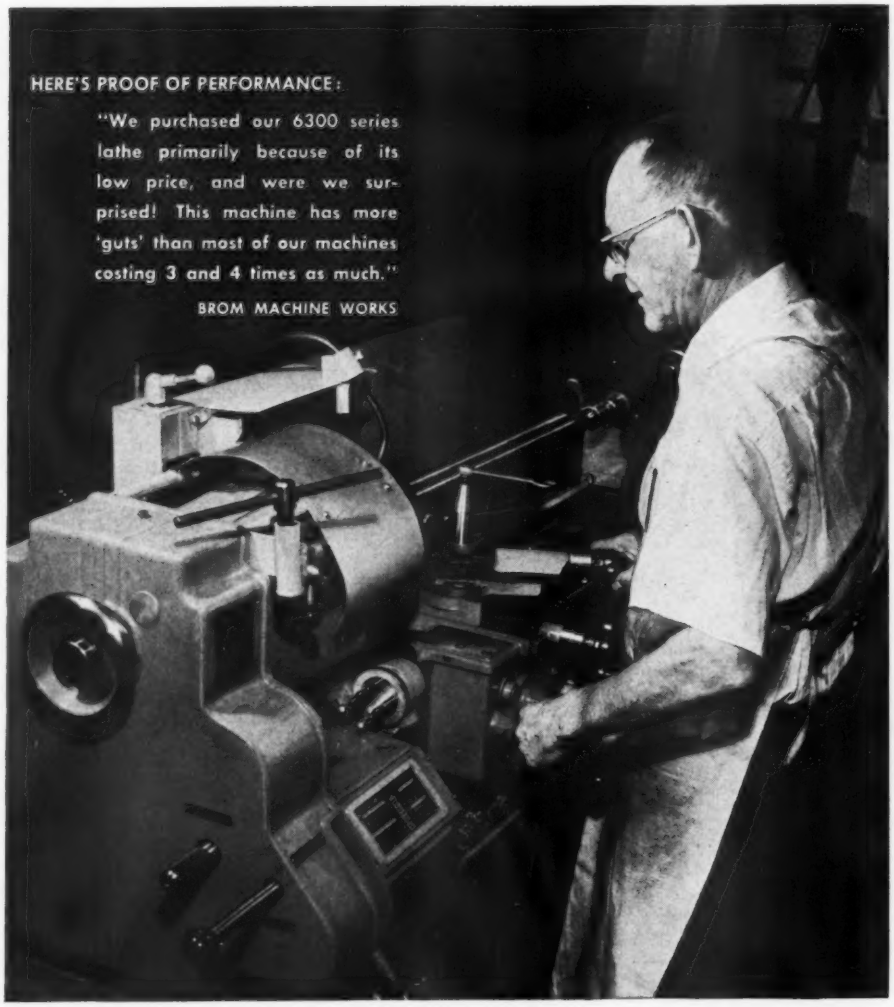
ADDRESS CITY ZONE STATE

CIRCLE INFORM-A-GRAM KEY NO. 17



Note heavy-duty construction of the 10-speed countershaft . . . the six ball bearings for smoothness and long service. Also available with heavy-duty variable speed countershaft.

Flame hardened bed ways are standard equipment at no extra cost — a feature that costs many dollars more in other lathes in the Clausing class.


HERE'S PROOF OF PERFORMANCE:
"We purchased our 6300 series lathe primarily because of its low price, and were we surprised! This machine has more 'guts' than most of our machines costing 3 and 4 times as much."
BROM MACHINE WORKS

BOUGHT on price—PRAISED for performance

"CLAUSING 6300 LATHE out-performs expensive machines"

The reaction of Brom Machine Works to the performance of their Clausing lathes is typical. Clausing 6300-series 12¾" lathes *do* set the standards for accuracy, efficiency and value in their price and capacity range. Here are a few of the reasons why.

Flame hardened bed ways are standard equipment *at no extra cost* on Clausing lathes. Headstock, apron and quick-change box are totally enclosed and gears and shafts travel in bath of oil — another important exclusive. Spindle is forged steel with 1⅜" bore, hardened and ground ASA — L-00 tapered key-locked nose. Spindle turns on Timken zero precision tapered roller bearings. Tailstock has No. 3 MT ram.

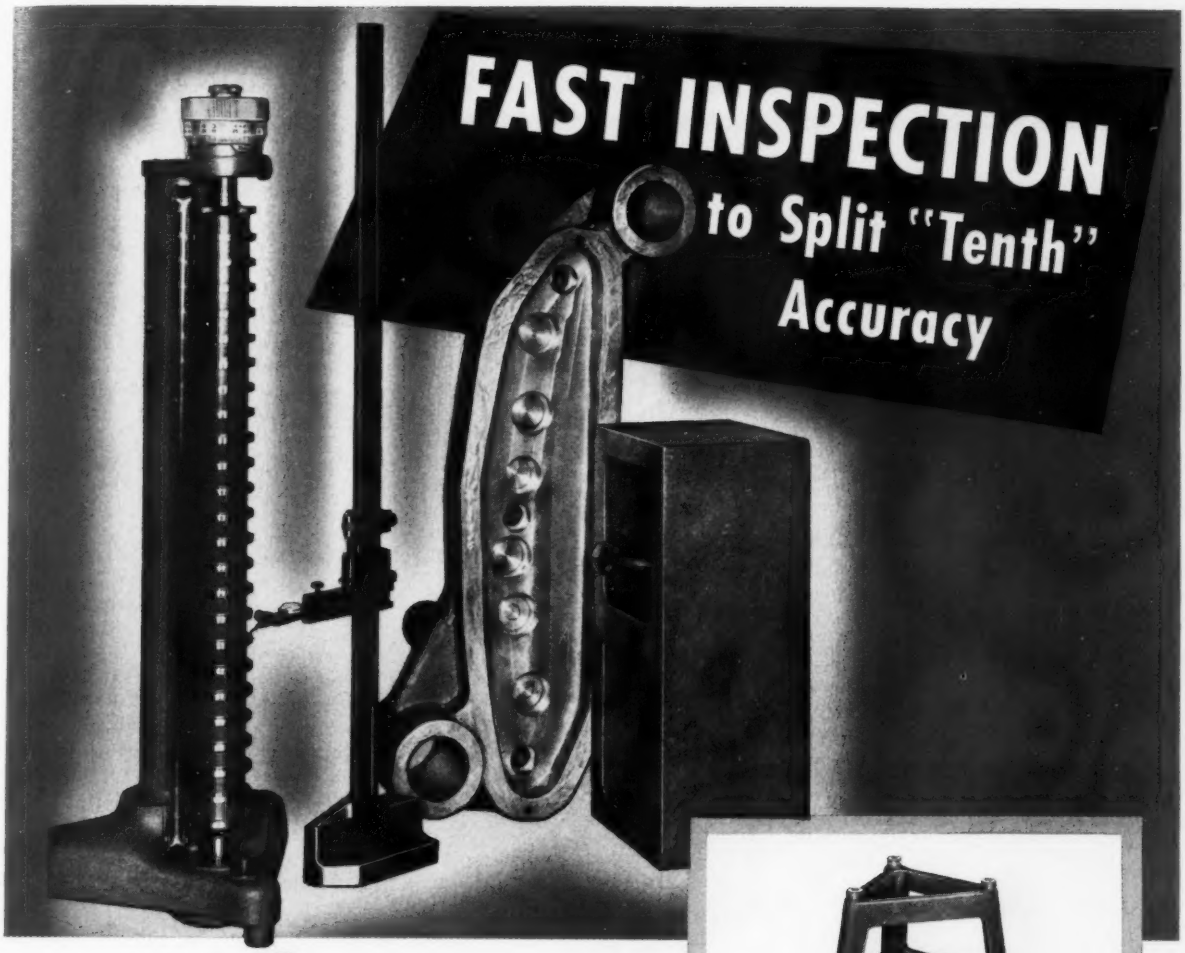
And superior performance is assured by more than superior features. Before it leaves the factory each Clausing lathe must pass rigid tolerance tests such as: spindle nose run out 0 to .0003" TIR, spindle taper run out at end of 12" test bar, 0 to .0006". The individual test report accompanying each lathe is an assurance it will machine with *dependable* precision. Compare *all* the features. Compare price. See for yourself why Clausing is acclaimed an outstanding lathe value — *the* lathe for *your* shop.

Write for free Literature

CLAUSING

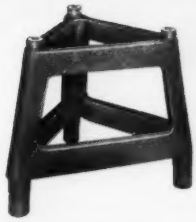
CLAUSING DIVISION
ATLAS PRESS COMPANY
5-115 N. PITCHER ST. • KALAMAOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 18



Cadillac PLA-CHEK

Height gage and micrometer settings are 5 to 20 times faster with Cadillac PLA-CHEK than with other methods of comparable accuracy. Less than 15 seconds establishes *any* dimension within a 24″ range to limits of less than .0001″. No auxiliary gage blocks necessary—PLA-CHEK is totally self-contained. Dimensions are taken from the surface plate or from a base line on the work. Send coupon TODAY for complete details!



Cadillac PLA-CHEK Gages are available in a complete range of sizes from the easily portable 6″ and 12″ models for smaller jobs, to the 18″, 24″, 36″ and 48″ models for larger inspections. Precision-made risers in 6″ and 12″ sizes, such as the 12″ model for the 24″ PLA-CHEK shown above, may be used with all PLA-CHEK Gages.

Cadillac GAGE COMPANY
P. O. BOX 3806 • DETROIT 5, MICHIGAN

MAIL THIS COUPON FOR COMPLETE DATA

CADILLAC GAGE COMPANY
P. O. BOX 3806, DETROIT 5, MICHIGAN
Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name_____

Company_____

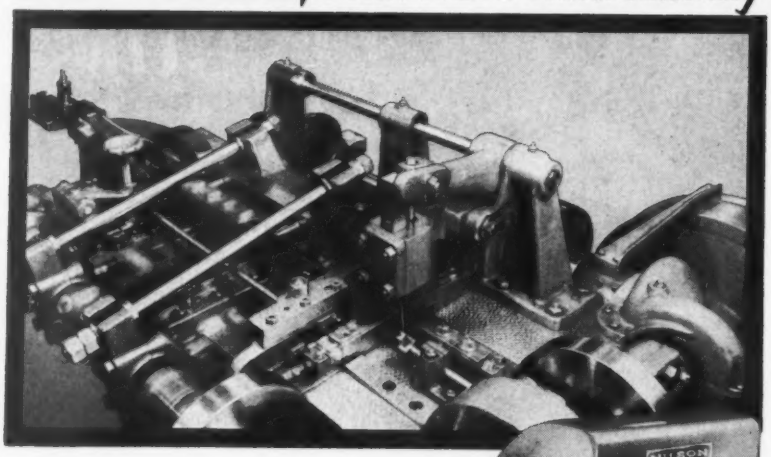
Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 19

NILSON 4-SLIDES

FORMING PRODUCTION PROFITS... *Automatically*



WHY

Cost-Conscious Companies

CHOOSE A NILSON

Every Nilson 4-Slide Forming Machine is designed with built-in flexibility! Most models handle either wire or ribbon metal with equal speed and accuracy . . . can combine stamping, welding and other secondary operations with the basic forming cycle. Easy access to tooling insures rapid setups, minimum down-time for job changeovers.

Whatever your forming application, there's a Nilson 4-Slide to do the work faster, more economically! With 17 horizontal models and the new "Vertiform" machine, Nilson offers you the widest selection of 4-slide equipment.

Investigate the cost-cutting advantages of Nilson 4-Slides in your operations! For a production evaluation of your parts, send prints or samples today.

Illustrated at top is Model S-1-F Machine, showing built-in press and open construction of forming area. Directly above is the new Vertiform Machine.

SIZE RANGES:
Wire up to ½" diameter
Ribbon stock to 3½" wide.
Feeds up to 32"
5 TO 75 TON
PRESS SECTIONS

NILSON
THE A. H. NILSON MACHINE CO.
1503 Bridgeport Avenue • Shelton, Conn.
AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 20

"Commendable Comments"

"Producers must move towards better methods, tooling, and techniques, much faster than in the past. Production lines must be altered and adapted to improvements and new design specifications with little delay. Self-testing devices must be built into systems and also into production lines. . . ."

—Rollin M. Russell, vice president and products group chief executive of the Hughes Aircraft Company, speaking at a recent press conference.

◆

"As can be seen from the foregoing, continual demand will emerge from this country's missile programs not only for machine equipment to satisfy normal obsolescence and wear replacement, but also to fill the void being constantly created for tools-to-be; tools which will perform machining operations that are today unknown, on materials new to the metalworking industry, or not yet developed."

—Louis L. Gober, Chief of the Engineering Branch, Industrial Operations Division, Army Ballistics Missile Agency, addressing the Thirty-Fourth Spring Meeting of the American Machine Tool Distributors' Association.

◆

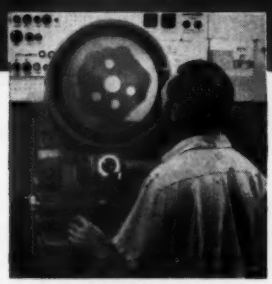
"Automatic assembly, seemingly the most promising field for product cost reduction will have a profound effect on machining operations because of the close tolerances required. Once we get further into that field there is no telling what drastic changes will be required in our metal removal equipment. Of course, the new approaches in manufacturing techniques will require a complete re-appraisal of the economics of production, but we have no doubt that great technological advances will be justified."

—Joseph H. Buhr, president of Buhr Machine Tool Company, at a recent press conference.

◆

"I predict that we can increase the volume of new orders for 1958 over 1957, in spite of our slow start. . . . The greatest potential for new machine tool business this year is the dire need of all manufacturers to beat the price-cost — profit squeeze and obtain higher levels of output per man hour — of course, this is right up our alley!"

—Frank H. Habicht, president American Machine Tool Distributors' Association, speaking before the 34th Spring Meeting in New Orleans.



With this Kodak Contour Projector Auburn Plastics, Inc., accurately gages a great variety of parts down to .001". Operator can easily measure angular dimensions on cams and keys, threaded mold components, center-to-center dimensions on parts and tools.

How many gages to inspect these parts?

Just one—if it's a Kodak Contour Projector.

Auburn Plastics, Inc., of Auburn, N. Y., a venerable custom molder, produces a wide variety of component parts for various manufacturers. Formerly this firm needed many mechanical gages to make necessary quality control checks.

A *Kodak Contour Projector* eliminated the expense of buying such gages—amounting in *one instance to a saving* of *$5,000.*

In a fiercely competitive business, Auburn Plastics, Inc., can submit *lower* bids because of savings permitted by *optical gaging.* The company effects additional economies by using its Kodak Contour Projector to inspect *tools* and *dies* as well as manufactured components. In all cases the projector permits gaging of angles, radii, holes and other dimensions—at a glance.

If you have an inspection problem involving myriad small parts, you can do the job easily and inexpensively with a Kodak Contour Projector. Inspection is a matter of comparing the projected image of the part with a chart gage on the screen. You inspect different types of parts simply by changing chart gages. Operators need little training.

For additional information or to arrange for a demonstration of any of the 6 Kodak Contour Projector models, write to:

Apparatus and Optical Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

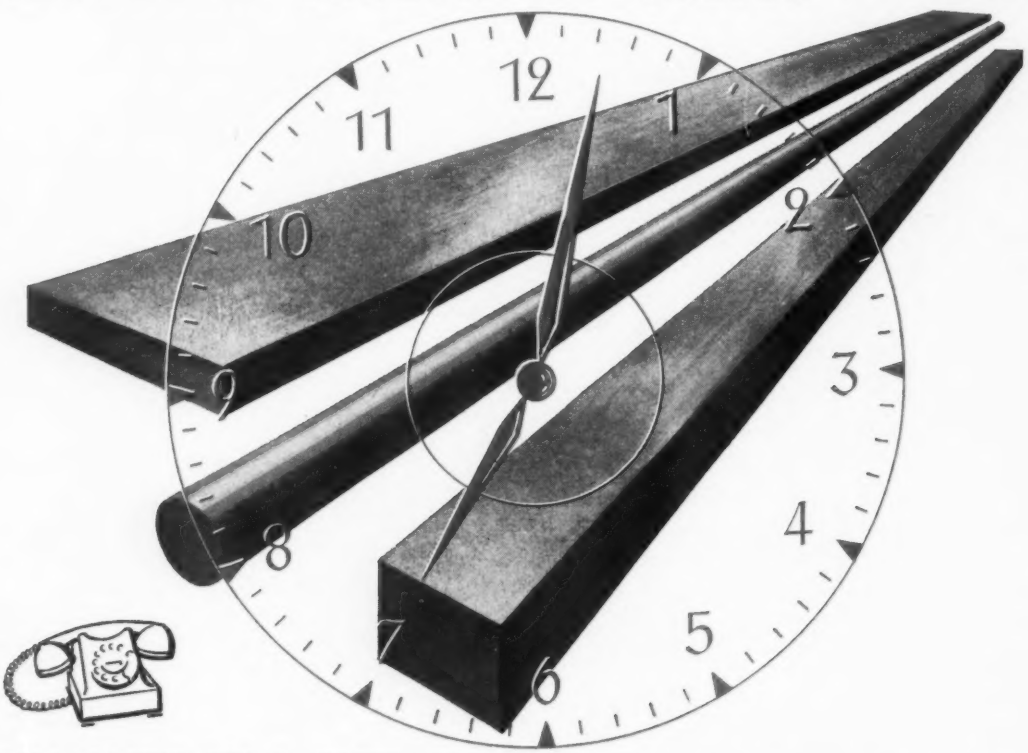
the KODAK CONTOUR PROJECTOR

Kodak

CIRCLE INFORM-A-GRAM KEY NO. 21

Firth Sterling ...

PIONEER IN POWDER AND MOLTEN METALLURGY



HOW FAST do you need the toughest oil-hardening tool and die steel ever made?

INVARO is available—for fast delivery—from Firth Sterling warehouse and distributor stocks of drill rod and ground flat stocks in all practical sizes. It offers tool and die makers consistent uniformity, better hardenability and greater safety in hardening—does a better job in a broad range of applications.

And the INVARO "Twins"—ground flat stock and drill rod—may be heat treated in the same furnace at the same time, exhibiting the same minimum dimensional changes. The resulting savings in time and production can be substantial. For further information, write for free technical bulletin.

INVARO oil-hardening tool and die steel is just one of the many types of electric furnace quality tool steels produced by Firth Sterling. These high quality tool steels are the result of Firth Sterling's continued research and development to provide specialty steels for use in the important tool and die industry.

* * *

If you have a metallurgical problem, powder or molten, we have the answer for it. Please let us hear from you. Firth Sterling, Inc., Dept. 11E, 3113 Forbes St., Pittsburgh 30, Pa. Offices and warehouses in principal cities.

Visit our booth at the
A.S.T.E. Show in Philadelphia—Booth 202

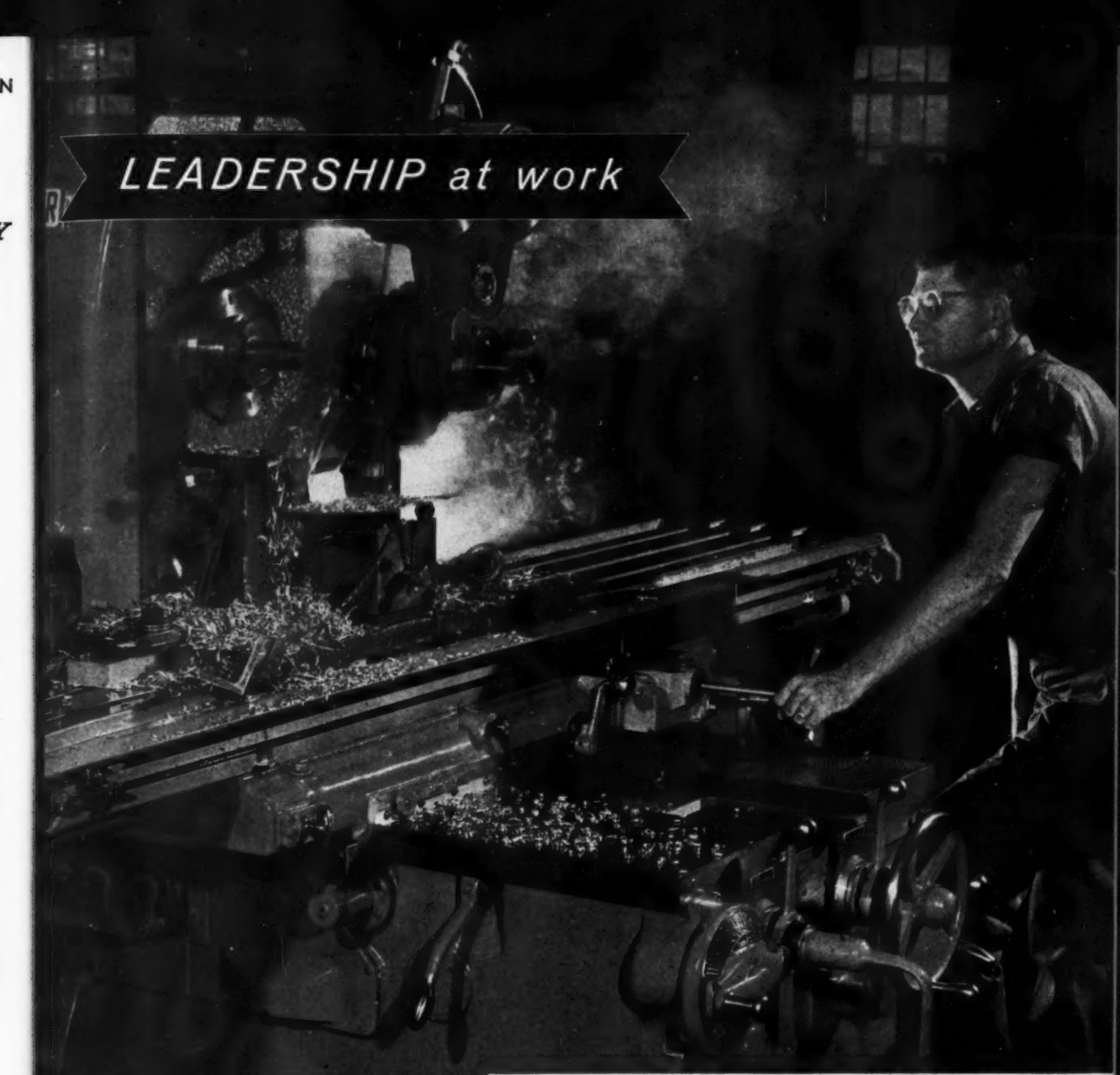
PRODUCTS OF *Firth Sterling* METALLURGY

HIGH SPEED STEELS • TOOL & DIE STEELS • STAINLESS SPECIALTIES • HIGH TEMPERATURE ALLOYS
SINTERED TUNGSTEN CARBIDES • HEAVY METAL • CERMETS • CHROMIUM CARBIDES
ZIRCONIUM • TITANIUM • STERVAC & STERCON SUPER ALLOYS

FIRTH STERLING TRADE MARK

CIRCLE INFORM-A-GRAM KEY NO. 22

LEADERSHIP at work



How's this for high-speed precision?

From solid aluminum forging to finished aircraft crank assembly in three passes — with precision throughout — that's the day-in, day-out performance of Jim Morris and his Kearney & Trecker—Milwaukee 625 TF Series mill. The job is at B. B. Parker & Son, Inc., Dallas . . . where production executives appreciate the value of twin elevating screws, available only on the TF Series mill line.

KEARNEY & TRECKER
MILWAUKEE

6776 W. NATIONAL AVE., MILWAUKEE 14, WIS.

Kearney & Trecker staff photo by Ron Johnson

Kearney & Trecker's man on the job . . .

Jack Groves of Greene Machinery Co., K&T distributor—helped B. B. Parker apply eight other K&T machines to their operations. *For expert milling counsel, call the K&T man near you. And remember to ask him, or write direct, for free comprehensive catalog.*

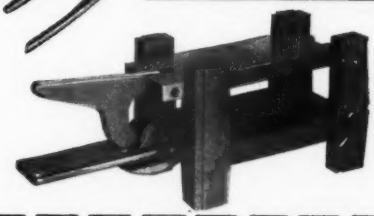
MAKE WESPO YOUR DESIGN STANDARD for ALL WORKHOLDING NEEDS

ASTE DATA SHEETS

WESPO TOGGLE CLAMPS & PLIERS

Over 80 types and sizes. From 5/8" Midget to 12 5/8" Clamp. PLIERS — from 1 3/16 Jaw Midget to 4 1/4 wide Jaw.

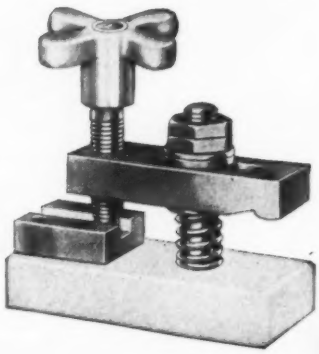
WESPO Toggle Clamps are made in types and sizes to meet all workholding needs, light, medium and heavy duty. Features include: REAMED HOLES, for better bearing, HARDENED BUSHINGS — SERRATED to prevent turning — HIGH TENSILE STRENGTH RIVETS for longer service.

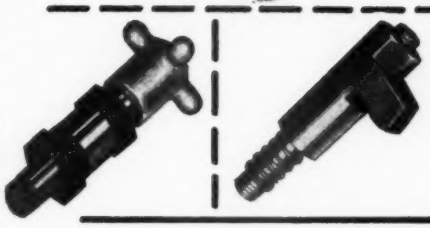


WESPO FIXTURE CLAMPS

Over 170 Types and Sizes

WESPO fixture clamp assemblies save up to 70 percent on your own designing and machining. They are used as standard by a large number of leading manufacturers.

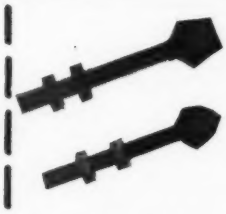




WESPO COMPONENTS

Over 1,000 types and sizes available from stock.

WESPO parts are precision manufactured of quality steel — heat treated and rustproofed. They are designed for heavy duty and long wear and have proved their value in many industries.



ADJUSTABLE SPINDLES FOR TOGGLE CLAMPS with BONDED NEOPRENE CAPS

Write for Catalogs — TOGGLE CLAMPS & PLIERS, FIXTURE CLAMPS and PARTS

WEST POINT MFG. CO.
26935 W. 7 Mile Road • Detroit 19, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 24

618 Electrolytic Grinder

Puts the bite on "Carbide"

Under actual shop conditions . . . *in a single pass* . . . the new Reid 618 Electrolytic Grinder has removed up to .090 from K1 carbide stock with a ½" wheel. The Reid Electrolytic has performed equally well on hardened steels and heat sensitive materials. Charts below show conservative ratings of stock removal under production conditions.

An "Anocut" 300 ampere unit furnished electrolytic power with the coolant used as a means of furnishing electrolytic salts and water to the wheel. Special spindle design, convenient controls and a 20 to 1 variable speed DC drive for the table, round out this highly versatile grinder. The grinding "finish" is burrless . . . and, in fact, eliminates much of the metallurgical damage caused by normal grinders.

For complete details write today.

REID 6 x 18
Electrolytic Surface Grinder
Readings Utilizing Metal
Bonded Diamond Wheel
7" Dia. ½" Width

TABLE FEED	DEPTH OF CUT	D.C. AMP. DRAW	SOURCE VOLTAGE	GRINDING VOLTAGE	INC. VOLTAGE SETTING	SUPP. SPARK SETTING	SPINDLE NO LOAD	SPINDLE LOAD	MATERIAL	VOLUMETRIC REMOVAL
¾"/MIN.	.040	210	12	12	55	55	2.3	3.7	KENAMETAL K1 CARBIDE	.015 CU. IN./MIN.
1½"/MIN.	.020	170	12	12	55	55	2.3	3.7		.015 CU. IN./MIN.
3"/MIN.	.010	200	9	9	55	55	2.3	4.0		.015 CU. IN./MIN.
1"/MIN.	.040	280	10	9	50	50	2.3	3.5	370 CARBOLOY	.020 CU. IN./MIN.
2"/MIN.	.020	230	10	9	50	50	2.3	3.6		.020 CU. IN./MIN.
4"/MIN.	.010	200	9	9	50	50	2.3	4.0		.020 CU. IN./MIN.
1"/20 SEC.	.020	250	11	10	86	77	2.3	3.0	CARPENTER STENTOR	.030 CU. IN./MIN.
1"/40 SEC.	.040	300	13	12	97	77	2.3	3.2	H.S.S. ROCKWELL 53C.	.030 CU. IN./MIN.

PRECISION SURFACE REID GRINDERS

Manufacturers of precision surface grinders for production and toolroom needs

REID PRECISION SURFACE GRINDERS

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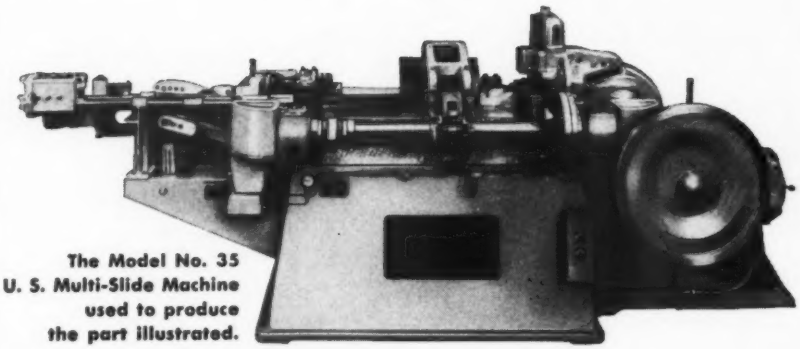


The Model No. 35 U. S. Multi-Slide Machine used to produce the part illustrated.

U.S. MULTI-SLIDE® MACHINES ELIMINATE SECONDARY OPERATIONS

The cost saving potential of U. S. Multi-Slide Machines is, once more, demonstrated here in the economical production of a stamped automotive part.

By using the No. 35 U. S. Multi-Slide, the Production Metal Stamping Company of Toledo, Ohio is able to completely eliminate all secondary operations and handlings in the production of the formed stamping illustrated.

The No. 35 U. S. Multi-Slide produces this part in one operation. Cold rolled steel .059" thick by 3.210" wide is fed into the machine from coils and finished parts are produced at the rate of 85 per minute.

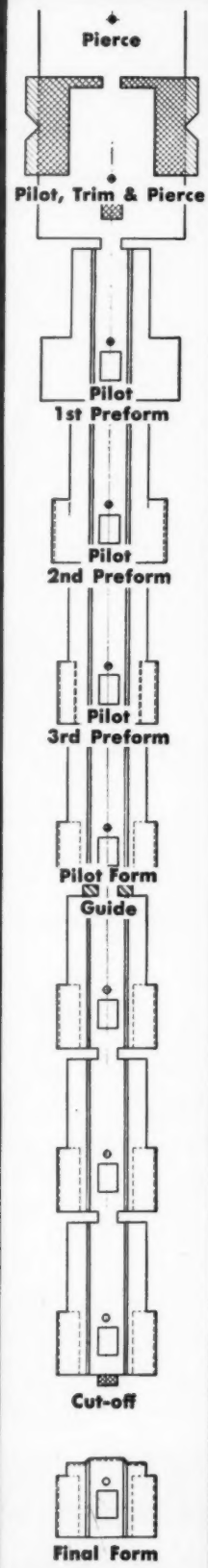
Each of the four models of U. S. Multi-Slide Machines is designed for the economical production of stampings. They are adaptable to the manufacture of wire parts as well as stampings from flat coil stock. In some instances more than one strip can be fed into a U. S. Multi-Slide for processing and completing an assembly. Prefabricated parts can be hoppered, positioned and assembled to the stampings being made while still in the machine. It is because of this versatility that the use of U. S. Multi-Slide Machines can considerably lower your component costs.

For the uniform, economical production of stampings — write for your copy of the U. S. Multi-Slide Bulletin No. 15-P — or send us your part drawings or samples for our recommendation.

MULTI-SLIDE

U. S. TOOL COMPANY, INC. AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories



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It takes LESS SPACE

Its ACTION IS FASTER

It is EASIER TO CONTROL

FOUR GOOD REASONS WHY YOU SHOULD BUY THE BELLOWS AIR MOTOR ...THE AIR CYLINDER WITH THE BUILT-IN ELECTRIC VALVE

When it comes to downright value, it's hard to visualize an air cylinder that can even approach the Bellows Air Motor. For here is a complete packaged air cylinder power unit with all controls built-in: 8-12 volt, electrically-actuated directional valve*, two independent speed controls, and an air transfer system that makes it possible to bring air to the unit through a single flexible hose. No extra valves to buy, no cumbersome piping to install.

1016-B

For detailed data — do this:

Write Dept. TP-558, The Bellows Co., Akron 9, Ohio (in Canada, Bellows Pneumatic Devices of Canada, Ltd., Toronto, 18) for Bulletin BM-25. Or, if you prefer, phone your Bellows Field Engineer—he's listed in the phone book under "The Bellows Co."

The feature of the integral valve brings important advantages. Installation is easier, electrical hook-up is simpler. It fits well in cramped quarters, or on moving machine elements. And of even more importance—the built-in valve means faster action, quicker response, less air consumption, and positive control over piston rod movement.

The Bellows Air Motor is made in five bore sizes: 1¼", 1¾", 2½", 3⅝" and 4½" and in any stroke length. You can have your choice of six different built-in valving arrangements, plus optional hydraulic piston movement stroke control.

*115 Volt for J.I.C. applications, if desired.

The Bellows Co.

DIVISION INTERNATIONAL BASIC ECONOMY CORPORATION

AKRON 9, OHIO

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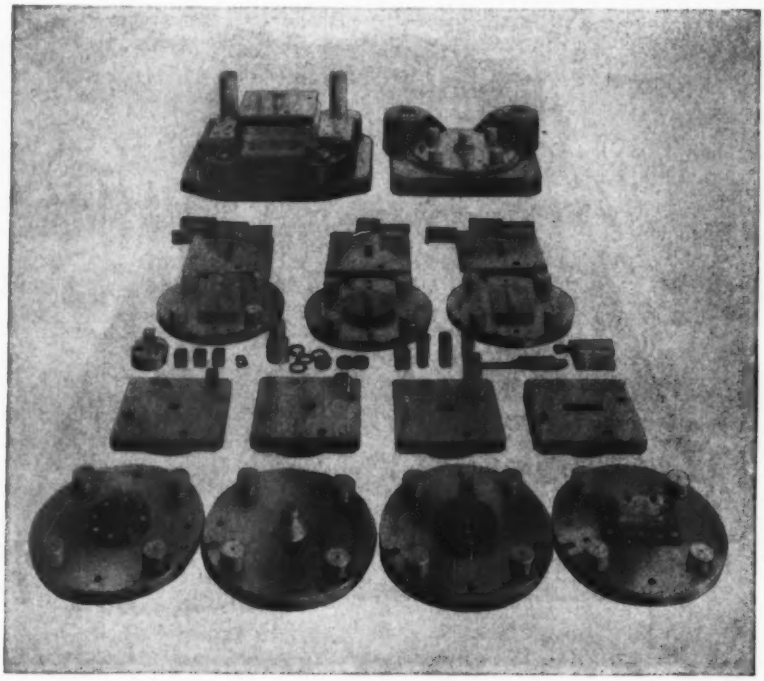

ALL THIS FROM ONE BASIC DIE

One basic die with 8 different sets of cutting members was used to trim the 8 parts shown. Some are round, some are square, some are rectangular and the one in the die is irregular. Depths vary from ¼" to 3". **Only one basic die is used.**

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VULCAN tools

CIRCLE INFORM-A-GRAM KEY NO. 28

Talk of the Month

PLANNING FOR TOMORROW'S OPPORTUNITIES

by F. R. Widmer
Assistant Manager
Commercial Research Division
REPUBLIC STEEL CORPORATION
Cleveland, Ohio

NOW THAT WE ARE IN THE PERIOD between booms our major task as executives should be the preparation for the next one.

Perhaps that statement comes as a surprise. Perhaps you were of the opinion that your major job was one of survival. I don't think so. Even a bear can live through the winter on last summer's accumulation of fat.

We in Industry have had almost 20 years of uninterrupted prosperity to accumulate a surplus. If we must, we can live on it for quite a while.

Sometime last fall, businessmen in the durable goods industries began to see that this thing we have finally had the courage to call a recession, was going to be somewhat more than the inventory corrections of '49 and '54. The reaction was a collective one; all over the country we banged our fists on the table and bellowed "Don't buy another thing . . . cut down that inventory . . . who said we needed a new roof . . . put a patch on it!"

The result has been a drastic reduction in the operations of the fabricating materials industries like steel and almost as sharp a drop in component fabricating. This drop has been somewhat greater than the decline in total industrial production. For example, the current Federal Reserve Board level is about 133% of '47 to '49 average, while steel op-

. . . *Continued on page 30*

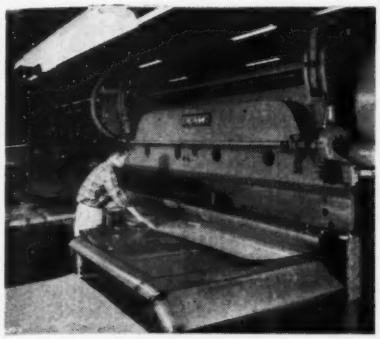
Adapted from Mr. Widmer's talk at the recent Spring Technical Meeting of the Pressed Metal Institute.

O-KNI-CO

MACHINE TOOL news

PRODUCTION FACTS THAT INCREASE YOUR PROFITS

PUBLISHED BY THE OHIO KNIFE CO., CINCINNATI, OHIO



65 ton Cincinnati Press Brake equipped with long-wearing O-KNI-CO processed shear blades.

Press Brakes built by Cincinnati Shaper for shearing laminated plastics, equipped with shear blades made by Ohio Knife Co.

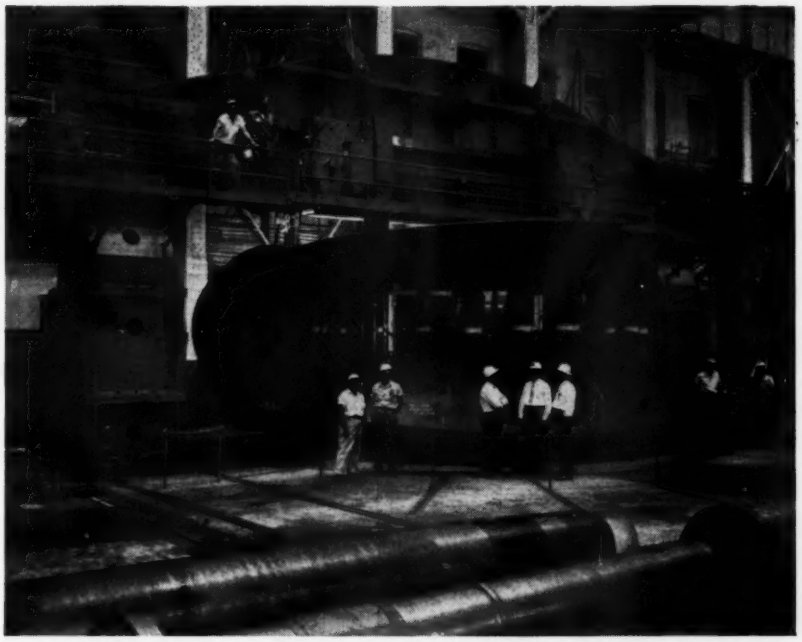
To eliminate cracked or "crazed" edges when cutting laminated plastic, four press brakes with a 65 ton bending capacity were built by The Cincinnati Shaper Co. Shear blades made by The Ohio Knife Co. were again selected to deliver the crisp, clean edges so necessary. O-KNI-CO heat-treating techniques applied give maximum toughness and superb edge holding qualities to these special high quality shear blades.

O-KNI-CO special shear blade cutting tough laminated plastic.

Now in Sweets catalog Product Design File

Helpful information on OHIO KNIFE CO. hardened products and their applications.

Tremendous 42 foot boring mill uses O-KNI-CO hardened ways on all wearing surfaces



One of world's largest boring mills equipped with O-KNI-CO processed wear plates.

"Believed to be the largest amount of hardened ways ever used on any machine tool" says Newport News Shipbuilding and Dry Dock Co. The table of this monster weighs 200 tons with an area of 2,375 feet. O-KNI-CO ways, made of "glass hard" ball bearing steel ⅝" thick eternally bonded to a soft, tough core or backing material, were used on all rails and rams. This produces a way that will not warp or bow. Special O-KNI-CO hardening process (65-66 Rockwell C) to the full depth of the tool steel along the entire length of the way, develops fantastic wear resistant qualities. The result is continuing accuracy of the machine under severest work loads.

Two foot wide clad bronze wear plates now being inexpensively produced up to 8 feet in length

The Ohio Knife Co., Cincinnati, Ohio, by a special new process is inexpensively producing bronze wear plates in unusually large sizes. Bronze of only the required thickness is used, clad to a soft, tough, machinable steel base. This steel backing imparts added strength and rigidity, eliminating any possibility of warping or bowing. The cost of these CLAD bronze wear plates is consequently much lower than old style solid bronze wear plates.

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7671

. . . Month's Talk from page 28

erations are at 90% of the '47 to '49 average.

Does This Mean Hibernation?

This sharp change seems to have brought with it a wave of gloom that in some cases borders on panic. Too many, it seems to me, are adopting the attitude that the best way to get through this recession is to "make like the bear" and go into hibernation; conserve our fat by reducing metabolism to an absolute minimum. Some day, we hope, will come the spring; grass will be green, berries will grow, and then we can get fat again.

If we were going to return to the kind of an economy that we had in '50, '51, '52, '53, '55, and '56, this hibernation business would be quite all right. The major point I wish to make is just this, however:

Those postwar years prior to '57 were *not* normal years. We *will not* return to that kind of an economy. Any company executive that expects to be bailed out of his problems by a *return* to that kind of an economy will someday discover that his fat is all gone and his spring has not come.

Why do I say that those postwar years were abnormal? In the first text on economics I ever used, published in 1928, a picture of normality is developed. First of all, we see that our economy has growth. Stated another way, we can confidently expect an improvement in our standards of living. Our measure of improvement 30 years ago was poor but we know it was derived from constant increases in productivity. We knew productivity came from the investment of capital in power, tools, and equipment; from a constant reduction in manhours.

We also knew that long term increases in production came from a compounding of productivity by population. In steel we translate this by first measuring the trend of per capita steel production and multiplying by the expected population increase. The book I referred to, however, says that our progress toward our long term hopes is never steady. You can calculate the average level of 1968 a lot better than the actual level of next quarter or next year.

Around our long term trend we have cyclical movements. One of these is the seasonal pattern. For the economy as a whole, business is high in spring, low in summer, high in the fall.

We also have a business cycle; some years are good, some bad, some average.

We also find that the economy as a whole is no measure of an industry or of an individual company. Normally, some industries are moving up, some down. If the weight is on the upside we generate a boom; conversely, a recession.

Even In a Boom, You Can Fail

We also find that even when the economy is in a boom and the industry you are a part of or serve is in boom, you can fail. On my first sales job for Republic in 1943 one of my towns was Fort Wayne, Indiana. In my prospecting I ran onto a tremendous foundry with many buildings and a row of cupolas. But, it was a dead hulk populated only by rats. It died in the prosperous late twenties trying to sell cast iron car wheels to the railroads in a wrought steel age.

These things are normal. We did not have them in the years '46 to '56. Why? It's easy to see as hindsight. We came out of World War II with a vast deficit of producing capacity, a deficit of consumer durable inventory, no corporate debt, no personal

. . . *Continued on page 33*

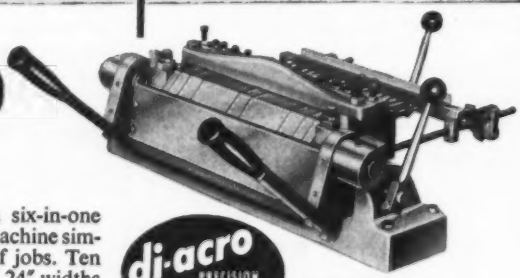
BOXES
Box fingers space to take box sides.
TABS
Bending Block does not disturb flat areas.
HOW TO FORM... Sheet Materials
HEMS
Acute angle is flattened in second bend.
RECTANGLES
Open end finger forms any closed shape.

with a

DI-ACRO BRAKE

The Di-Acro Brake is a six-in-one precision metal working machine simply tooled for a variety of jobs. Ten models in 6", 12", 18" and 24" widths handle up to 16 gauge mild sheet steel.

Consult the yellow pages of your phone book for the name of your nearest Di-Acro distributor or write for 16 page "Handy Guide" to Di-Acro Brakes.



di-acro PRECISION METALWORKING MACHINES

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O'NEIL-IRWIN MANUFACTURING CO.

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VERSA-MIL

- compact
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SAVES HANDLING, MOVING, SET-UP and DOWNTIME

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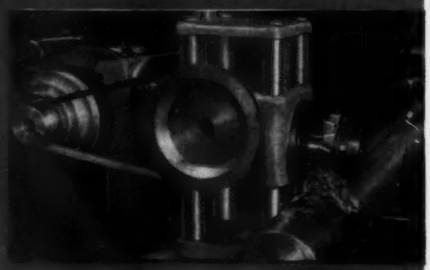
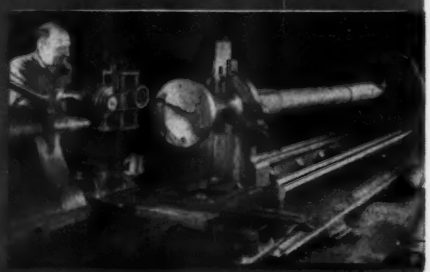
MILLING 5" IDEWAY ON A PLANER



SLOTTING 42"-LONG ON A LATHE



BORING AND DRILLING ON SAME SET-UP

This *new* machine efficiently performs at any angle, in any position or direction, as an independent unit with its own power and feeds, or added to machine tools — lathes, planers, shapers, millers, grinders.

Gives close tolerance results while removing metal at *profitable* rates. Adapts quickly to work on standard machines, fixed machinery in place, pieces in fixtured set-ups, or on parts too big for standard machines. *It gives you the advantage of machining where it is most economical!*

*Basic Unit F.O.B. Racine

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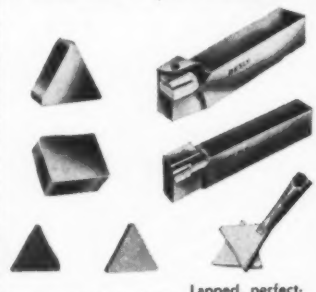
BESLY *Complete* CARBIDE SERVICE

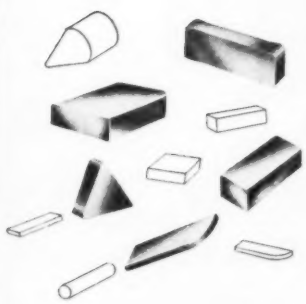
Lapped TOSS-AWAY INSERTS and HOLDERS



Commercial Finish | Besly Finish | Lapped, perfectly flat surfaces easily wring together.

Special Besly lapping process gives more tool life per cutting edge with less chipping and breaking. Wide range of sizes, positive and negative rakes. Holders in styles and shank sizes to fit the job.

BLANKS



In sizes, grades and styles for every cutting need. Standards include: reamer blanks, lathe center blanks, rectangular strips, solid cylinders, pulley grooving blanks and others. "Specials" made to order.

TIPPED TOOLS

Standard tools supplied in a variety of grades, sizes and styles for turning, facing, boring, chamfering, planing, milling, end cutting, threading and grooving in cast iron, non-ferrous, steel and steel alloy metals. Modifications and "specials" made to fit specific jobs.

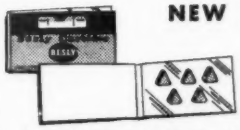
only tools with perfect radii...

...means that BESLY carefully makes every Carbide Tool to the highest standards of **accuracy** and **quality**

Only the best materials and methods are used in their development — advantages which give you longer life, less downtime, fewer rejects and higher production rates at lower cost.

A complete range of standard styles and sizes is always available for *overnight delivery* through your Besly distributor. Ask him for Catalog 857 and for Besly's super-service on "specials."

NEW PACKAGING



Skin-Pak for Inserts and Blanks

Lapped toss-away inserts, carbide blanks, in standard package quantities, are conveniently arranged on 3" x 5" file card size fold-over cardboard pack secured with transparent polyester film for complete protection. Besly's new package prevents chipping of cutting edges and insures perfect condition, ready for instant use.

Plastic-Pak Cigarette Box for Tipped Tools

Standard tools inserted in Styrofoam and packed in individual, attractive plastic "cigarette" boxes. Provides easily identified, handy, fully-protected tool packages always ready for use.

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CIRCLE INFORM-A-GRAM KEY NO. 32

. . . Month's Talk from page 30

debt, surplus capital, surplus personal savings, an exploding population, and no housing. The list of positive factors is almost endless.

It's no wonder that the economy plunged into a frenzying of production. The upward rush washed out the old economic factors of seasonal patterns, business cycles, and divergence of industries — it almost wiped out the possibility of business failure.

We got our second wind with Korea. We got our third wind with the new look on autos in 1955. This in turn sparked a fresh round of capital expansion. It was about here that the sharp observer began to see that the overriding national stimulants had about run out.

In 1956 we saw housing, autos, and other consumer durables slide steadily away from their '55 peaks, while capital goods climbed toward a '57 peak. Here was our "diverging industries." For some years there had been sharp seasonal swings in production of consumer products — again a return to a normal economy.

We measured productive capacity, industry by industry, against trend line projections and came up with the fact that by 1957 there would be a capacity to produce even peak demands — everywhere. A decline in capital goods seemed inevitable. Well they did decline! And now we have come full circle. The last indicator of normalcy is here. We've got ourselves a recession!

We are going to get out of this recession; we always have and we will again. That too is normal. The question is how and when, and what will we have when we get there?

Getting Through the Recession

Let's look at the "how." Right now everyone's attention is centered on government. We are thinking in terms of a tax cut, lower interest rates, readily available credit, larger defense spending, a speed-up in public works.

These things will come and they will help. They are not enough, however. Industry too must do its share.

Look ahead — growth is normal — the best years of the '60s will dwarf '55 and '56. But, that's in total; it may not be your industry, it may not be your company.

A normal economy has a surplus of production capacity. Whenever there is a surplus, competition is just "something awful." That too is normal. Tough competition generates efficiency and lower costs through reinvestment in better tools, better systems, better ingenuity. You must do this. Otherwise your competition will price you right out of the market.

Remember my Fort Wayne car wheel foundry? Where is *your* new product to replace the one that some competitor will obsolete for you next year and the year after?

Do these things now and our recession is only a lull between two booms. Make like the bear and hibernate and our spring will be a long time coming.

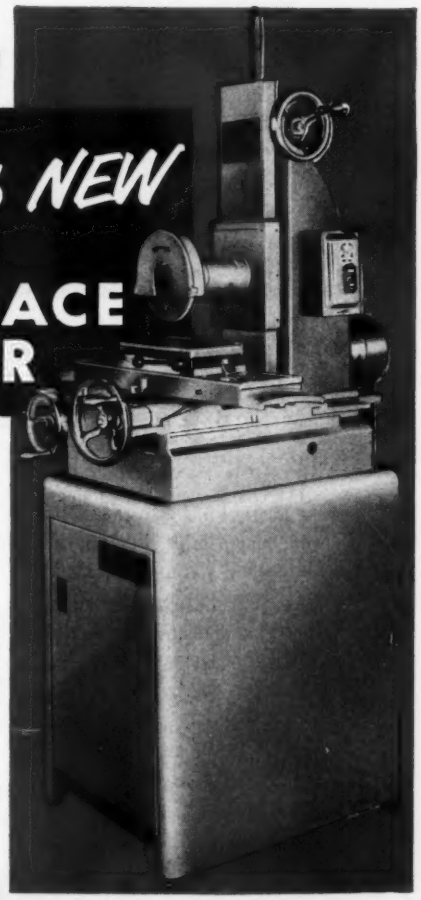
'Seems like I'm in a rut of animal analogies, but I must use one more. Years ago I had an uncle in South Carolina. Every Christmas he sent us a Southern ham. The flavor of that ham was quite a change, but the most startling thing was the appearance. It was a slab about six inches thick by a foot wide, with a leg bone about three feet long.

On a quail hunt one year I found out how it got that way. Being used to our penned up, corn fed northern hog I got quite a shock when I ran

. . . *Continued on page 34*

Performance Plus!

Harig's NEW 6 x 12 TML SURFACE GRINDER



The new TML by Harig provides extremely fast and accurate grinding, with a new operational ease never before known. 100% more longitudinal travel than before with each rotation of the wheel. You get smooth surfaces in minimum time. Economical—low maintenance.

SPECIFICATIONS

Longitudinal travel.....12¾"
Transverse travel.....7"
Vertical travel.....12¾"
Working surface of platen.....6" x 12"
½" T slot
Grinding wheel.....7" dia. x ½" face
Grinds 12¾" over platen with 7" wheel
Standard spindle speed 3000 R.P.M.
½ or ¾ H.P. motor—Net wt. with motor 575 lbs.
Can be used with or without floor stand.

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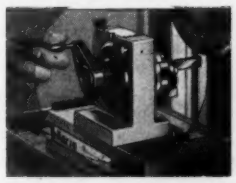
NEW HARIG GRIND-ALL FIXTURE



Fast, accurate perforator grinding attachment — hand crank for easy rotation of index plate, single locking screw for making quick set-ups.

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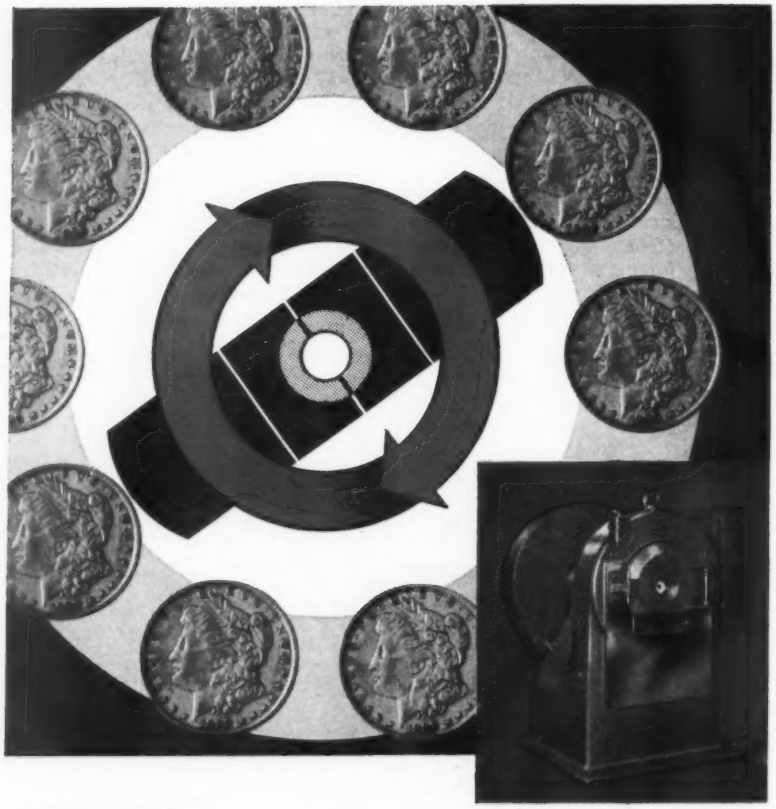
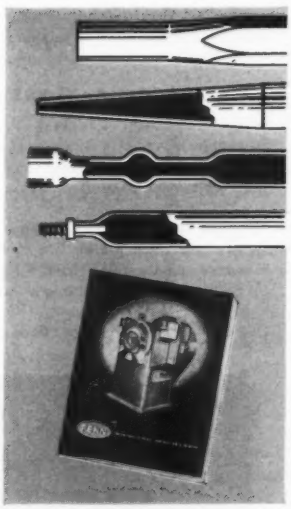


Moneymaker

Fenn Rotary Swaging makes money by saving money for its users. In fact, with swaging, you save five ways:

- low initial capital investment
- tooling is relatively low in cost
- material savings
- labor savings
- time savings

Fenn Swaging Machines offer many advantages in both design and construction. They perform an almost limitless variety of pointing, tapering, reducing, sizing, and assembly operations. Capacities range on solid bar stock from 5/32" to 3⅜", and tubing to 6". To be sure that you are not machining when you should be swaging, write for Fenn swaging catalog.



FENN Sets the Pace IN ROTARY SWAGING

Fenn Manufacturing Company • 202 Fenn Road • Newington, Conn.
CIRCLE INFORM-A-GRAM KEY NO. 34

. . . Month's Talk from page 33

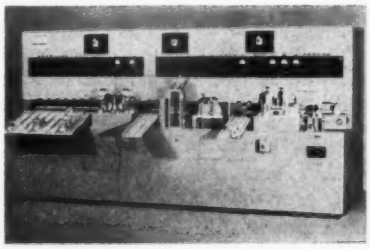
into a herd of those southern razorbacks in the woods. There was no pen and no corn. It was a case of root, hog, or die. This operation of rooting to live produced a hog that could run like a rabbit, turn on a dime, and make a living on anything from a handful of peanuts to a chunk out of your leg. He was a mean, fast-moving critter.

For the last ten years Industry has been a northern hog. Now we've got to get up off our corn-fed hams and root for our peanuts. In the process we'll run off some fat, but we'll also move further, faster, and live longer. end

AUTOMATIC INSPECTION GAGES PISTONS AT 1800 PER HOUR

An Arlin Products, Inc. four-station cybernetically controlled electronic inspection machine is available which automatically feeds, gages, and segregates automotive engine pistons.

The model illustrated automatically inspects piston pin holes for alignment, distance of bored holes to piston face, outside diameter for dimensional size between predetermined points, and bore diameter, and prints proper size definition on the piston face. Production rate is 1800 pcs/hr.



Each station of the machine is controlled individually by an electronic cybernetic system which anticipates the requirements of the machine and controls the flow of parts from station-to-station, and the action in and out of each station.

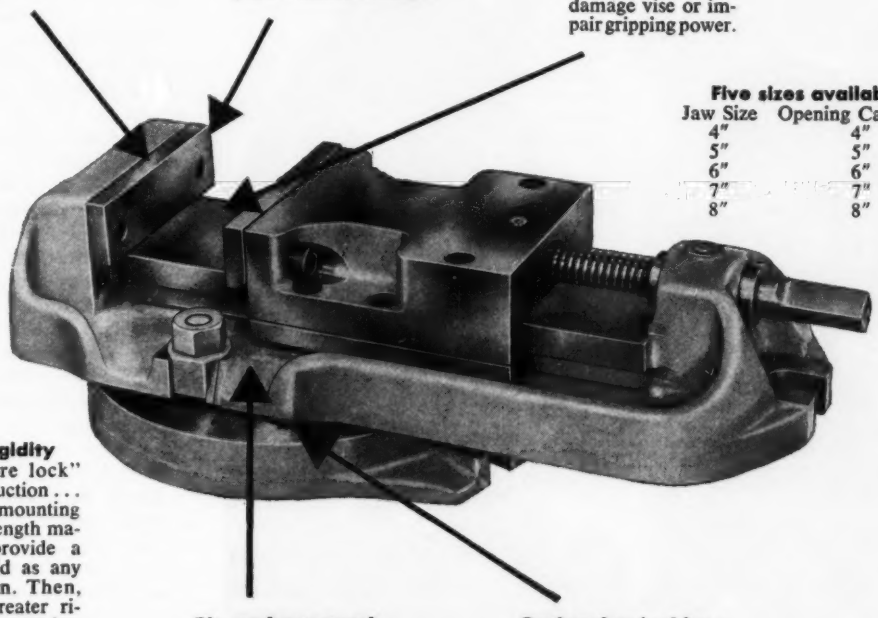
The Arlin gage heads used to check piston dimensions do not contain any bearings, gears, racks, magnets, or coils, but operate on a radar-type reflected wave circuit using a frequency of 30,000,000 cps. They can operate to 0.000001" constantly with 100% repeatability with no wear even after years of service. The electronic circuit is of plug-in design, and is divided into packaged units which may be easily removed for fast inspection or replacement.

NEW SKINNER VISES NOW AVAILABLE!

Biggest capacity
Opening capacity is equal to the full width of the jaws . . . gives you far more holding room for heavy, accurate machining.

For rough or finished work
The rugged jaws, capable of withstanding tremendous strains, are precision machined to hold your finest parts without damage.

Flat, smooth body
There are no slots or ridges . . . no way for chips to get under movable jaw to damage vise or impair gripping power.



Five sizes available

Jaw Size	Opening Capacity
4"	4"
5"	5"
6"	6"
7"	7"
8"	8"

Extra rigidity
The "square lock" way construction . . . wide table mounting . . . high-strength materials . . . provide a vise as rigid as any you've seen. Then, for even greater rigidity, Skinner has made available a center hold-down screw.

Big coolant trough
The coolant returns to machine table—will *not* slop over edges.

Optional swivel base
Vise can be set at any angle through a 360° arc in a horizontal plane.

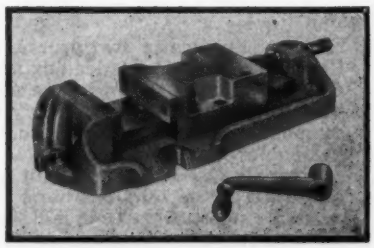
These are the new trough vises you've been looking for

Skinner is proud to offer these new vises to manufacturers who demand modern equipment that measures up to their ever-increasing standards of production.

They've got everything we've been asked for—rugged dependability, extreme accuracy, the ability to hold rough or finished work under the most rigorous conditions.

They combine the finest of materials with Skinner's unmatched experience and craftsmanship to give you tremendous holding power!

See your industrial distributor or write us for full details on Skinner's new Series F and FS trough vises today. Write Dept. 195.



Skinner Vises and Chucks are available through leading Industrial Distributors everywhere.

SKINNER CHUCKS

THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 35

CLEARING O. B. I.'s RATE A+ FOR RUGGEDNESS

This automobile door arm of ⅝" carbon steel is typical of the heavy duty jobs turned out by Clearing O. B. I.'s.

"No maintenance in two years", is one of the comments about a Clearing O. B. I. at this leading midwestern job shop. Their sixteen Clearing O. B. I.'s range from 45 to 150 tons capacity. They are used primarily to produce heavy duty automobile trunk and door components. It's rough work, but that's the kind these Clearing inclinables were designed for.

Clearing O. B. I.'s are built to true machine tool standards. Operation is smooth; operators like them. In addition, they are available with all controls built-in, everything in place and ready for fast, simplified installation.

Why not see for yourself? Write for Clearing's O. B. I. Catalog. We'll send it promptly. No obligation.

CLEARING PRESSES

the way to efficient mass production

CLEARING MACHINE CORPORATION *division of* **U.S. INDUSTRIES, INC.**

6499 W. 65th Street—Chicago 38, Illinois / Hamilton Division, Hamilton, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 36

MEN YOU SHOULD KNOW

Donald G. Dutcher is now serving as chief electrical engineer at Hanson-Van Winkle-Munning Co.

◆

Volkert Stampings Inc. has announced two additions to its staff. **Frank H. McCrohan** is the new assistant to the plant manager, and **J. Randolph Schumacker** is a new sales engineer.

◆

Robert S. Root has been appointed chief engineer of both Clutch Division and Machine Tool Division of Lipe-Rollway Corp. Formerly chief engineer of the Clutch Division, Root succeeds **E. R. Fish** as chief engineer of the Machine Tool Division. Root will be responsible for all production research, experimental, and development engineering for both divisions.

◆

James A. Erdle is the new chief engineer at Johnson & Hoffman Mfg. Corp., manufacturers of precision stampings and deep-drawn parts for electronic assemblies and general industrial applications, and an affiliate of Superior Tube Co.

◆

Illinois Gear & Machine Co. has announced the election of **T. S. Pacer** as executive vice president.

◆

Election of **Carl F. Stugard** as vice president of Cincinnati Milling and Grinding Machines Inc., sales subsidiary of The Cincinnati Milling Machine Co., has been made known. He is also manager of the Special Machine Tool Division.

◆

Plant manager of the Tucson, Ariz., operations of Hughes Aircraft Co. is **John W. Black. Louis L. Reasor,** former manager of services, succeeds Black as assistant plant manager.

◆

The appointment of **Dan E. Harrison** as vice president and general manager in charge of the Midwestern Division of True-Trace Sales Corp. was announced recently. He will direct the operations of the Racine, Wis., and Westbury, L. I., N. Y. plants and supervise dealer operations.

◆

Serving as plant manager of the Beatty Machine and Mfg. Co. is **Charles E. Peters.**

Sundstrand Machine Tool Co. has announced elections of vice presidents. **Carl L. Sadler,** general manager of the Sundstrand Aviation Division, was elected vice president in charge of that division. **Richard H. Olson,** general manager of the former Aviation Division, was elected vice president in charge of the new Sundstrand-Turbo Division.

◆

Vance T. Wray has been appointed manager of Chrysler Corporation's McGraw Stamping Plant where he will direct and coordinate all service and production facilities.

◆

William A. Morton has been named president of Loftus Engineering Corp. **James M. Guthrie** is serving as executive vice president, **Walter Suydam** is vice president of sales, and **John F. Corcoran** is vice president.

◆

Executive vice president and general manager of Gear Grinding Machine Co. is **William F. Wilson.**

◆

Wade H. Shorter, Jr., general manager of Emhart Mfg. Company's research, development, and engineering operations, has been elected a vice president. **John W. Murray,** formerly assistant manager of the department, has been named manager.

◆

Federal Pacific Electric Co. has made **Frank S. Nelson** manager of its Scranton, Pa., plant and **Bernard G. Tremblay** assistant plant manager at Newark, N. J.

◆

New plant superintendent of the Bronx, N. Y. plant of Finkel Outdoor Products, Inc. is **Eugene Burger.** He will also serve as staff consultant to the recently enlarged West Haverstraw, N. Y. plant. In this capacity he will supervise the expanded plant facilities.

◆

Election of **Harry P. Troendly** as a group vice president of Borg-Warner Corp. has been announced. He was formerly president of the corporation's Spring Division.

◆

William F. Boyle has been moved from general manager of the Pelton Division of Baldwin-Lima-Hamilton Corp. to general manager of the Hamilton Division. He is also vice president of the Philadelphia corporation. **Ira Morgan White,** chief engineer at Pelton, has been elected a vice president, and named to succeed Boyle as Pelton general manager.

SPEED UP YOUR PRODUCTION WITH A

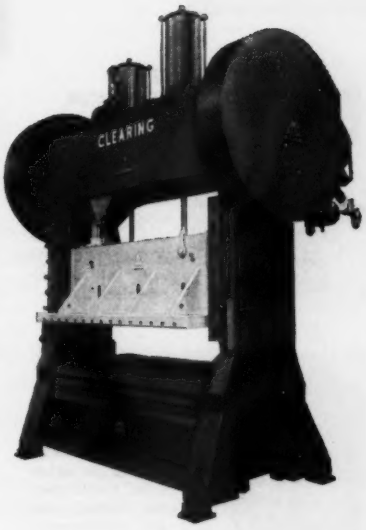
CLEARING Hi-Speed Press

Here's a speedster that's engineered especially to get the most out of your expensive progressive dies. Special, beefed up frames insure precision in the stampings—less frequent die regrinds and consequently, longer die life. Find out about the presses that can speed up your schedules as well as give your dies maximum protection—the Clearing Hi-Speed Press. Capacities—50 through 200 tons. Speeds to 300 SPM.

Write for descriptive literature.

What You Should Know About

Press Capacity



A leading producer of home appliances is using the press above to good advantage. Clearing Series-S presses combine the precision of a straight side machine with a basically economical design.

This manufacturer can schedule a number of jobs for his machine—regardless of die height—and *know* he has the available press tonnage for each job.

Clearing provides a means for determining tonnage at *all* points of the stroke. A chart in the Clearing Series-S catalog shows press capacity which will be a helpful guide for determining capacity for all forming operations.

Write for your free copy.

BULLETINS

- ☐ Automation Accessories
- ☐ Unusual Press Applications
- ☐ Clearflo Lubrication
- ☐ Plunger Guiding
- ☐ Overload Device
- ☐ Micro-inching
- ☐ Enclosed Presses
- ☐ Cushions

CATALOGS

- ☐ Series-S Crankshaft Straight Side
- ☐ O.B.I.
- ☐ Bottom Drive
- ☐ Hydraulic
- ☐ Brochure—"New Economics of Press Automation"

MOVIES

- ☐ A Modern Fable
- ☐ Transflex—Automation in Action
- ☐ Modular Automation
- ☐ Automation Comes of Age

CLEARING PRESSES

the way to efficient mass production

CLEARING MACHINE CORPORATION *division of* **U.S. INDUSTRIES, INC.**

6499 W. 65th Street—Chicago 38, Illinois / Hamilton Division, Hamilton, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 37

PRECISION PRODUCTION PROBLEMS ?

Here's help from Bausch & Lomb

in TOOL DESIGN
INSPECTION
FABRICATION
MEASURING
TESTING

NEW! ALIGNMENT INTERFEROMETER

Accurately measures small changes in angle over a range of 30 seconds of arc (±15 seconds). Easy direct scale readings to 0.2 seconds (0.000006").

BENCH COMPARATOR

Exclusive understage illumination—no complex set-ups, no holding fixtures for most work. Magnified silhouettes show errors instantly. Reads to 0.0001" with optional micrometer stage.

STEREO-MICROSCOPES

Magnified 3-D views of tiny parts. Dustproof, shockproof, can be mounted right in machine or fixture. Speeds assembly, inspection. Most complete line, widest field of view.

CONTOUR MEASURING PROJECTOR

Shows magnified silhouettes or surface views. Simple operation, highest precision measurements: to 0.0001", linear; to 1 minute of arc, angular.

OPTICAL AIDS CATALOG

Time-and-money-saving data on Surface Comparators, Industrial Magnifiers, Macroscopes, Microscope Bodies, Micrometer Discs, Wide Field Tubes, Brinell Microscopes, Shop Microscopes.

NEW TOOLMAKER'S MEASURING MICROSCOPE

Quickly measures opaque or transparent objects of any contour. Linear, accurate to 0.0001"; angular, to 1 minute of arc.

MAIL COUPON TODAY FOR VALUABLE DATA

BAUSCH & LOMB OPTICAL CO.
77329 St. Paul St., Rochester 2, N. Y.

Please send literature on optical production aids checked below:

☐ Alignment Interferometer ☐ Bench Comparator ☐ Contour Measuring Projector ☐ Toolmaker's Microscope ☐ Stereomicroscopes ☐ Optical Aids Catalog

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COMPANY .....
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CITY ..... ZONE ..... STATE .....

BAUSCH & LOMB
SINCE B&L 1853

CIRCLE INFORM-A-GRAM KEY NO. 38

At Your SERVICE

Quality control services are provided by Burns and Roe, Inc. of New York. They offer such engineering functions as the design of quality control systems; inspection of facilities and purchased supplies at the vendor's plant; inspection and testing at the job site of equipment, materials, and systems; and the handling of special problems.

•

A combined research, development, and production center for roll forming of new metals will be inaugurated in August by The Siegler Corp. through its Hufford Corporation Division. Facilities include a new spinforge machine developed to produce a wide range of conical and cylindrical contours from the high temperature resistant metal alloys.

•

Deep Hole Specialists, Inc. of Chagrin Falls, Ohio, specialize in deep hole drilling of unsymmetrical workpieces. Types of work include subcontracted operations or parts furnished complete, in large or small quantities.

•

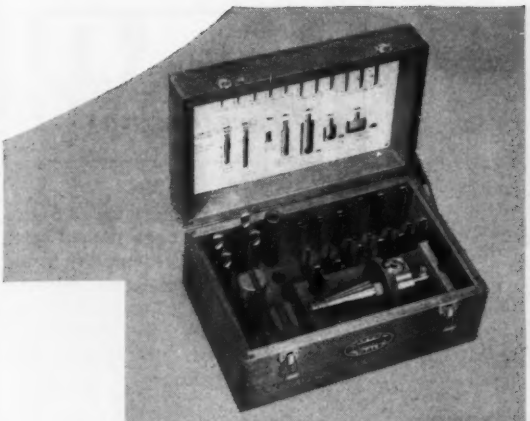
Spur gears, helical gears, sprockets, ratchets, and many other items are made by The Adams Co. of Dubuque, Iowa. Additional operations such as gear tooth rounding or chamfering, gear tooth shaving, thread grinding, broaching, heat treating, and external and internal grinding, are also offered.

•

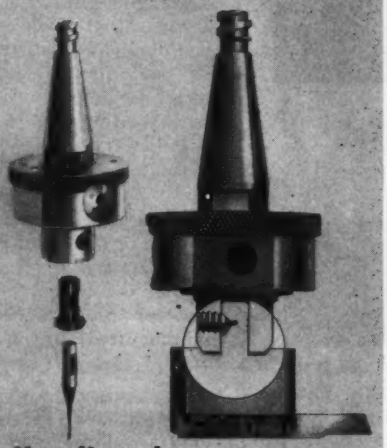
U. S. Metal Coatings Co., Inc. now has facilities for handling weights up to five tons in the hard chromium plating of rolls, rams, and cylinders, and other large and heavy pieces of machinery. Grinding, polishing, and other finishing operations are also provided.

•

The formation of a Contract Department for volume production of special fabricated sheet metal products has been announced by Penco Metal Products Division of Alan Wood Steel Co. of Oaks, Pa. Machinery, housings, control panel forms and other paneling, custom tote boxes, steel shipping containers, display and storage racks, are some of the products that can be made to customer specifications.



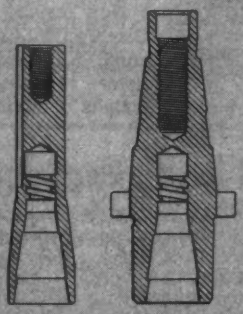
Packaged Set
includes boring chuck, reducer bushing, extension bar and tool bits.



How it works

Holes from 5/32"... Note 1/2"–3/8" reducer bushing for either 1/2" or 3/8" shank holes.

To 5" holes... Here 1/2" shank is merely a drawback to use nose end of chuck for stiffness.



Bridgeport Millers
can utilize Moore Boring Chuck Set by means of shank adapter at left. Another Moore adapter (right) fits machine spindles with No. 40 tapers.

One Moore Boring Chuck Set bores any hole from 5/32" to 5"

Here's an ideal way to hold down your investment in boring machine accessories. The unique Moore Boring Chuck Set is like three sets in one...boring the complete range of holes from 5/32" to 5". And with just one chuck for both tool bit shank sizes, you save chuck-changing time, too.

Dependable Moore-quality workmanship and design show in every detail of the chuck and tool bits. To insure years of accurate use, all chuck components, including the adjusting lead screw, are hardened and ground. The chuck is completely dust-protected, and its large, clear dial has 50 graduations...increases hole .001" in diameter per graduation. The chuck will start behind center for small holes and move to 3/8" plus. It's easy to unclamp, move and reclamp slide in exacting increments. One wrench fits all screws. The tool bits are available in either high speed steel or carbide-tipped.

And here's the best news of all! Originally designed for use with Moore Jig Borers only, this completely packaged boring unit can now be purchased with appropriate shank adapters to permit its use with all Bridgeport Millers or any machine with a No. 40 Taper.

For further information and complete ordering instructions, just drop a line to...

Moore Special Tool Company, Inc.

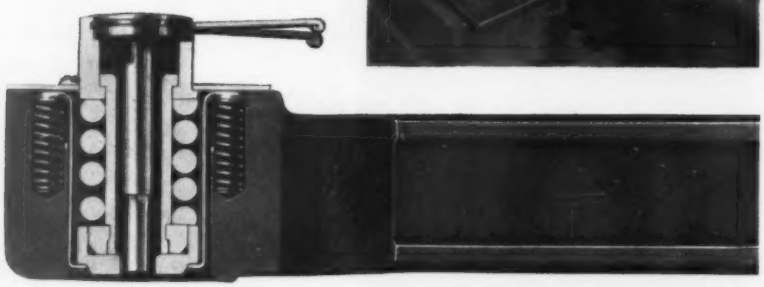
726 Union Avenue, Bridgeport 7, Connecticut

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 39

Strippit Punching and Notching Units are easily mounted to templates, T-slotted plates or rails in unlimited patterns for long press runs or quick-change pilot runs. Complete range of standard tools, or "specials" made up on request.



the **bench man** does the tooling!

STRIPPIT multiple punching and notching

THE ABOVE CUTAWAY of a Strippit Punching Unit — one of a wide selection for flats, structurals and extrusions up to ¾" mild steel — illustrates the extreme flexibility, high production and economy of the Strippit system.

NOTE THAT each unit is complete with punch, die button, stripping guide, guide button, lifter assembly and retainers — all quickly interchangeable in a husky holder and actuated by the press ram. Multiple punching — and notching — press setups are easily bench-assembled on drilled mounting templates, with each unit accurately located by the pilot pin in its base. Press down-time is almost negligible in setups of Strippit Punching Units, Notching Units, Punch and Die Assemblies or combinations of all three.

Write today for full details and if you wish, a demonstration on your work at your plant by a Strippit mobile unit.

Warehouse stocks in Chicago and Los Angeles.

WALES STRIPPIT COMPANY

212 Buell Road, Akron, New York

Manufactured in Canada by Strippit Tool and Machine Limited, Brampton, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 40

Presenting . . . Representing . . .

The B-H-S Machinery Co. of South San Francisco has been named sales and engineering representative in the northern California area for the Michigan Tool Co. They will represent the complete line of machine tools, cutters, and checking devices produced by Michigan.

•

Appointment of Chesapeake Machinery Co. of Pasadena, Md., as sales and engineering representatives in the Washington-Baltimore area for the Colonial Broach and Machine Co. has been made known. Romulus Sales and Engineering Co. will represent the Colonial-Romulus Division of the company in Michigan and Ohio.

•

The American Platinum and Silver Division of Engelhard Industries, Inc. has been appointed a national distributor of Nicrobraz brazing products for high-temperature service manufactured by Wall Colmonoy Corp.

•

Representing The Producto Machine Co. in southern California is the Machinists' Tool & Supply Co. of Los Angeles who will stock precision die sets, die makers' accessories, and toolroom equipment.

•

Now serving as representatives for Size Control Co. in Arkansas, Mississippi, Kentucky, and western Tennessee is Branch-Merwin Tool Specialists of Memphis.

•

The appointment of Jake Franzen Co. of Santa Clara, Calif., as representative for northern California and western Nevada was announced by Freeland Gauge Co.

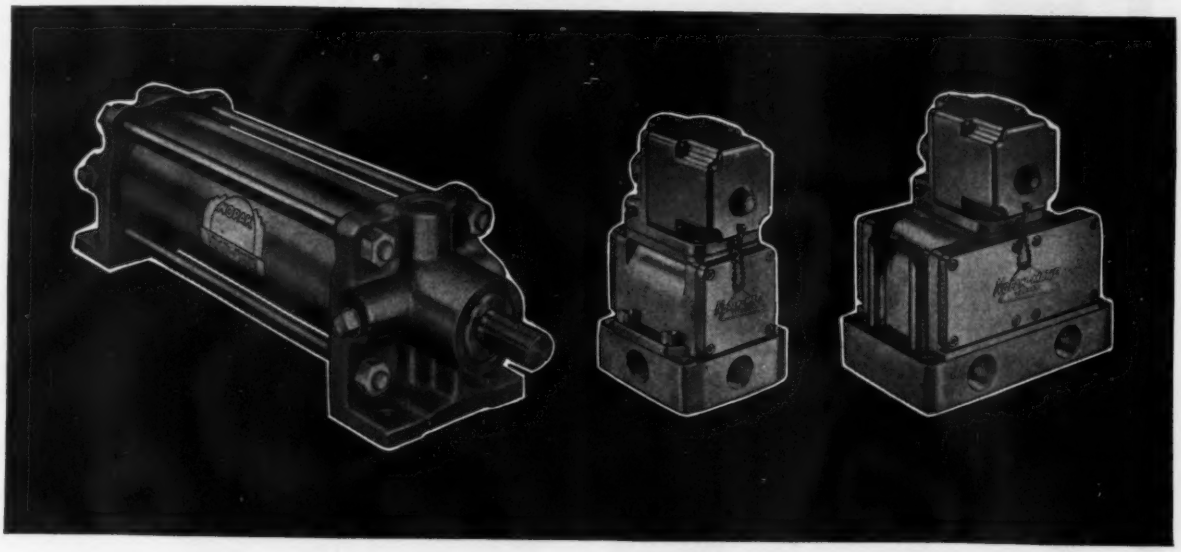
•

Companies now representing The Nylok Corp. are Russell Assoc., Brightwaters, N. Y. and Baltimore; Northeast Sales Engineering, Hamden, Conn.; Factors, Inc., Seattle; The Monroe Co., Cincinnati; and Strother and Assoc., Inc., St. Louis.

•

C. B. De Korne Cutting Tools Co. of Grand Rapids, Mich., is a stocking distributor for Detroit Tap and Tool Co. in western Michigan.

It's NOPAK for fluid power products



When you specify... specify Nopak Valves and Cylinders and you are assured of efficient, low-cost performance that will confirm your good judgment through many years of trouble-free service—even under severe working conditions. The wide selection of Nopak air and hydraulic products meets your fluid power requirements.

A Great Team! Nopak Air Cylinders are being used to great advantage with the new Nopak-matic, Pilot Operated, Air Control Valves. Together they have proved a great team in many successful "in plant" and O.E.M. applications. Send for Nopak Catalogs 101 and 105 for complete engineering and application data.

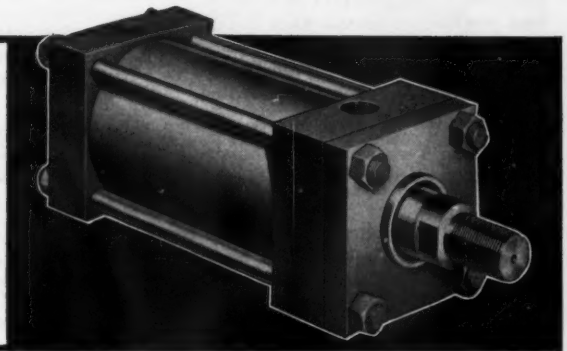
NOPAK Class 1 and 2 Air Cylinders are available in 7 standard mountings in bore sizes from 1½" to 14" with a choice of non-cushioned, self-regulating or adjustable cushioned heads on all models. Class 1 Cylinders, in most standard sizes, are available from Shelf-stock at the factory and other convenient locations. Write for Shelf-stock listings.

Nopak-matic Valves — Nopak-matic, Pilot-operated Poppet-type Air Control Valves are available in ¼", ⅜", ½" and ¾" pipe sizes for 2- or 3-Way normally open or normally closed operation, and 4-Way operation. Master (air), single or double solenoid control heads interchangeable on all models. All valves available, as standard, with choice of side or bottom ported sub-plates. Air pressures to 150 p.s.i.

New NOPAK Square Head Design

Hydraulic Cylinders give you quality, delivery, price, and complete interchangeability with most units of this type. This new line of Nopak Hydraulic Cylinders offers a complete selection of standard mounting styles (15) plus many combinations; a complete range of bore sizes (1½" thru 8"); operating pressures to 2000 p.s.i. and 3000 p.s.i. non-shock; proven design and construction.

Investigate the advantages — you'll specify NOPAK Square Head Hydraulic Cylinders! Send for Catalog 103.



See us at the
FOUNDRY SHOW
Cleveland, May 19-23
Booth No. 2213

NOPAK VALVES and CYLINDERS

GALLAND-HENNING NOPAK DIVISION • 2782 South 31st St. • Milwaukee 46, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 41

Gang Cutters perform 5 Milling Cuts in 48 Seconds!

Dual Frame Forging Ready For Milling—Slitting Saw Separates 2 Parts.

Completed Brown & Sharpe Micrometer

Precision B·S Cutters Produce Precision B·S Micrometer Frames

Shearing action designed into these special Brown & Sharpe cutters gives a smooth, accurate finish on tough steel micrometer frame forgings.

Uniformity of product is vital . . . and positive, close tolerance milling is accomplished through experienced cutter development to produce fine surface finishes with no overheating, no piece distortion.

Angular-gash design of the outside form-relieved cutters quickly, precisely and economically mill outside contour. Two pairs of interlocked form-cutters (second from end) give smooth micrometer throat surface finish without chatter or scoring.

Even the cutter chips indicate the degree of precision built into B & S PRODUCTIONEERED cutters.

Call on the local Brown & Sharpe Cutter Engineer to trouble-shoot your production problems.

Write for 96 page Catalog 37C showing over 2500 High Speed Steel Tools and Accessories to: *Cutting Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.*

PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe

CUTTING TOOL DIVISION

NELCO CARBIDE TOOLS B·S HIGH SPEED STEEL CUTTERS

PRECISION TOOLS AND GAGES • MILLING GRINDING AND SCREW MACHINES
MACHINE TOOL ACCESSORIES • PUMPS AND HYDRAULIC PRODUCTS

CIRCLE INFORM-A-GRAM KEY NO. 42

James D. Kreager has been promoted to the position of sales manager of the Engelberg Huller Co., Inc., Abrasive Machine Division. Greager will direct and coordinate all activities of sales and will make his headquarters at the Engelberg home office in Syracuse, N. Y.

•

Denison Engineering Division, American Brake Shoe Co., has announced these appointments: **Don Arnold,** manager of Detroit district office; **Howard R. Brumleve,** Cleveland field engineer, Pump and Control Sales Division; **Lawrence M. Krebs,** Detroit field engineer, Multipress Division; **David R. Clague,** sales representative, Pump and Control Division, Cleveland; and **Richard Lawrence,** field engineer, New York City, marine applications.

•

Latrobe Steel Company's four new salesmen are **Dave Bellis,** Philadelphia; **Bill Cornish,** Boston; **Dick Hughes,** Detroit; and **Bob Rahm,** Chicago.

•

Richard Rouviere has been appointed to the newly-created position of regional sales manager for the northeastern states and Canada for Devcon Corp., and will be responsible for all the corporation's hardware and industrial lines. He was formerly market extension engineer for the United States and Canada.

•

Carl W. Blade has joined Firth-Loach Metals, Inc. and will represent the company in the New England territory. He will be located in West Haven, Conn.

•

Appointment of **F. R. Curse** as sales manager for the Stainless Processing Division of Wall Colmonoy Corp. has been announced.

•

New field engineer in the Indianapolis territory for Norton Co. is **Davis B. Foy.**

•

Recently appointed sales manager for the Onsrud Cutter Mfg. Co. is **William L. Parlon.**

•

Raymond Wise recently was appointed sales manager for the H. P. Townsend Mfg. Co.

•

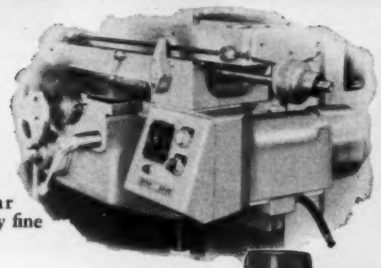
Serving as sales and engineering representative for Michigan Tool Co. in Kentucky, Illinois, and Indiana is **Robert T. Sheppard.**

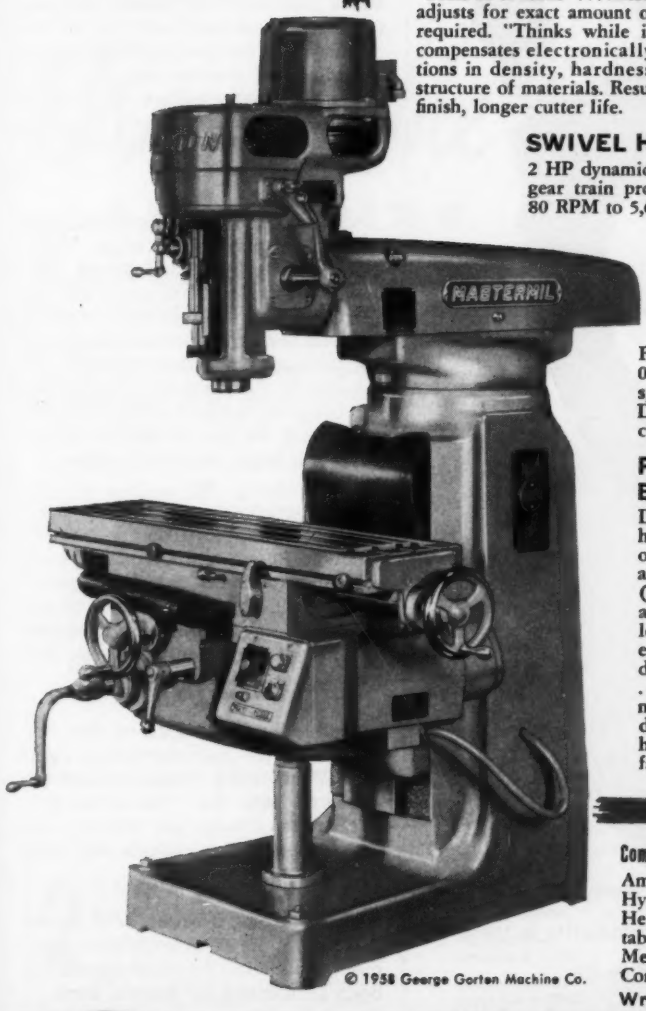
Eventually you'll buy a GORTON MASTERMIL

here's why

DYNA-DRIVE
"The Torque-Thinking" Table Feed

"Feels as it feeds" . . . automatically adjusts for exact amount of torque required. "Thinks while it works", compensates electronically for variations in density, hardness, molecular structure of materials. Result: Superbly fine finish, longer cutter life.





SWIVEL HEAD

2 HP dynamically balanced motor with belt and gear train provides wide range of speeds from 80 RPM to 5,600 RPM. Head swivels 90° left or right, head, ram and turret rotate 180°. Cross movement 14 inches. Push button starting.

DOWN FEED INFINITELY VARIABLE

Feeds may be varied infinitely from 0" to 5" independent of spindle speeds. High efficiency belt drive. Direction and rate of feed separately controlled.

PERMANENT ACCURACY BUILT-IN

Distortion is prevented by extra heavy one-piece column cast with over-size ribbing . . . extra heavy alloy steel turret clamping bolt (1⅜" dia) with 3-point clamping action . . . heavy dovetail way full length of vertical column face . . . extra large table, knee and 24" saddle (2" longer than table travel) . . . square lock bearings with long, narrow guide between knee and saddle . . . positive locks . . . extra heavy feed screws . . . bearing surfaces hand-scraped.

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Complete Versatility Through Attachments Built-In or Field Installed.

Among such equipment is, Trace-Master Hydraulic Tracer Control, Duplicator Tracer Head and/or Table with base, saddle and table in one unit, 6" Raising Block, End Measuring Rods and Dial Indicators, Self-Contained Coolant System.

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Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A8-1008

CIRCLE INFORM-A-GRAM KEY NO. 43

SHOW STOPPER

It's the new Torrington Verti-Slide, the first major innovation in the field of VERTICAL 4-SLIDE equipment in 50 years!

This machine was designed to meet a growing need for greater productivity and profitability in the cost-critical area of wire and strip forming.

Seldom before has a new machine created such immediate and widespread interest. We urge you to get the full story. Write or call today.

THE TORRINGTON MANUFACTURING COMPANY

TORRINGTON, CONNECTICUT · VAN NUYS, CALIFORNIA · OAKVILLE, ONTARIO

CIRCLE INFORM-A-GRAM KEY NO. 44

GROWING PAINS

The new Foundry and Machine Division of **Beloit Iron Works** is a mechanized foundry for making ductile iron, cast iron, semi-steel, bronze, and aluminum castings from 5 lbs to 40 tons. There is also a large fabrication shop for machine frames, bases, special applications and a machine shop capable of performing almost any operation on the casting and fabrication they make, including roll grinding and gear hobbing. Also included are three large normalizing furnaces, a roll foundry, and a large X-ray vault using the cobalt 60 process.

◆

An ultra-modern power metallurgy fabricating plant at Sturgis, Mich. will be built by **Bound Brook Oilless Bearing Co.** This plant will be geared to high volume production of sintered bearings and parts and will use various fabrication methods developed by the company's engineers. The company is also modernizing and expanding its Bound Brook, N. J. plant and large research facilities.

◆

The operations of the Punch Division and the Special Tooling Division of **Pivot Punch and Die Corp.** have been consolidated into one plant. This provides for production of expanded lines of commercial punches and Pivot's straight ground and whipsleeve punches.

◆

Production has begun on the new 106,000 sq ft manufacturing plant and West Coast repair center of **Rockwell Mfg. Co.** The plant produces and repairs gas meters and other Rockwell products for this area.

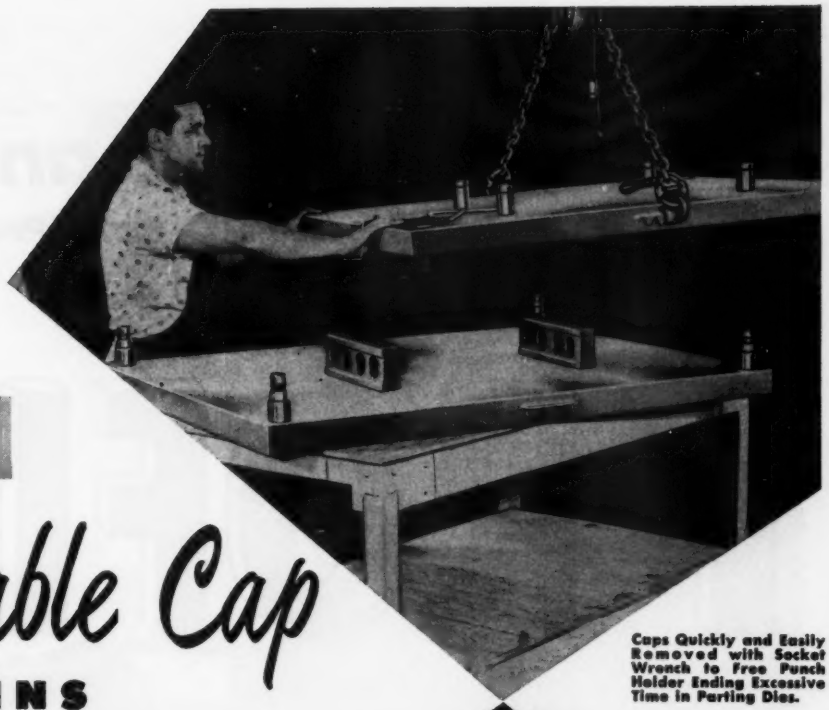
◆

Plans for the erection of a 150,000 sq ft plant in Tennessee, to supplement production for all divisions, has been announced by **Harsco Corp.**

◆

Solar Steel Corp. has made known the beginning of an expansion program at its River Rouge Plant. The proposed construction, expected to be completed in June, will double the size of the office facilities and increase certain plant areas.

one man parts large die set in 3 minutes *with*

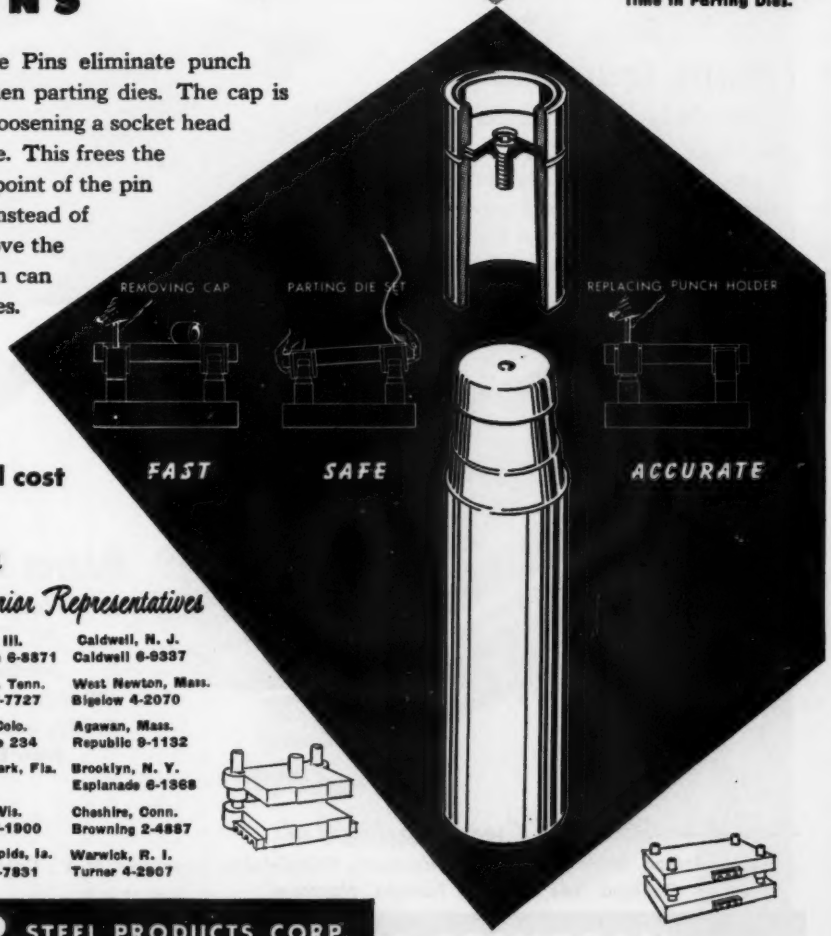


Caps Quickly and Easily Removed with Socket Wrench to Free Punch Holder Ending Excessive Time in Parting Dies.

SUPERIOR

Removable Cap GUIDE PINS

Superior's Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can do this work alone in a few minutes.



NOW on every Superior die set in diameters from 1½" upward at no additional cost

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Indianapolis, Ind. Clifford 5-5668	Denver, Colo. Enterprise 234	Agawam, Mass. Republic 9-1132
Rockford, Illinois 3-3931	Winter Park, Fla. 4-0464	Brooklyn, N. Y. Esplanade 6-1368
Dayton, Ohio Hemlock 6208	Racine, Wis. Melrose 2-1900	Cheshire, Conn. Browning 2-4857
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CIRCLE INFORM-A-GRAM KEY NO. 46

GRAND RAPIDS *accuracy for production grinding*

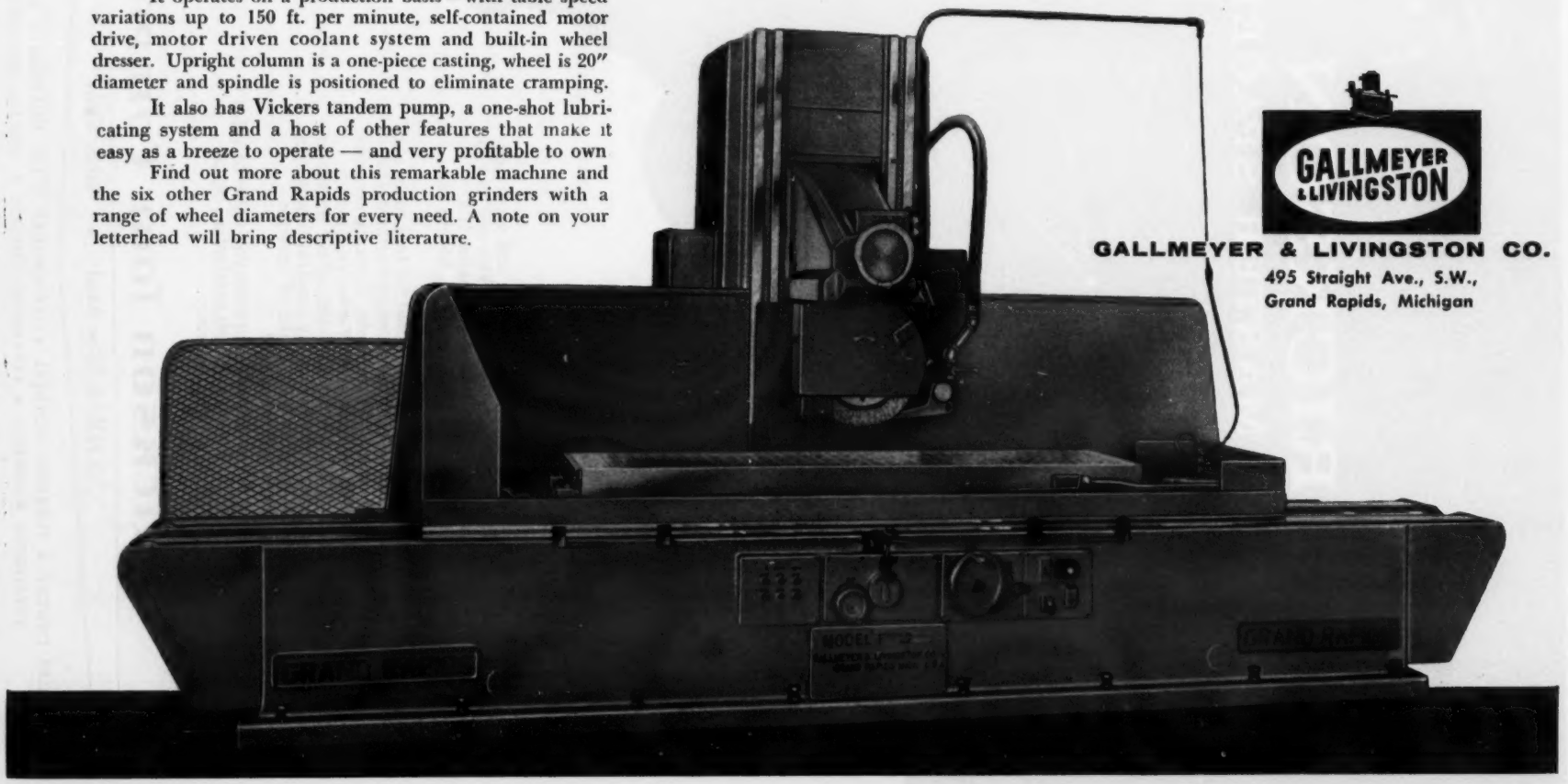
Now high speed, big surface production grinding can enjoy the same Grand Rapids accuracy that's always been a "must" for the toolroom. The Grand Rapids Model F Production Type Hydraulic Feed Surface Grinder offers the same micro-metric precision that has made Grand Rapids famous for accuracy everywhere.

It operates on a production basis – with table speed variations up to 150 ft. per minute, self-contained motor drive, motor driven coolant system and built-in wheel dresser. Upright column is a one-piece casting, wheel is 20" diameter and spindle is positioned to eliminate cramping.

It also has Vickers tandem pump, a one-shot lubricating system and a host of other features that make it easy as a breeze to operate — and very profitable to own

Find out more about this remarkable machine and the six other Grand Rapids production grinders with a range of wheel diameters for every need. A note on your letterhead will bring descriptive literature.

Grand Rapids Model F Surface Grinder accurately grinds big surfaces at unsurpassed speeds



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CIRCLE INFORM-A-GRAM KEY NO. 47

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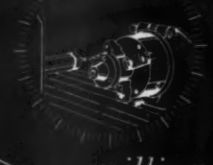
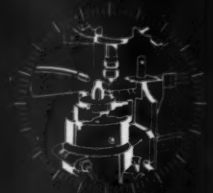
with No. 0 Timken Bearings

gives increased production and optimum accuracy in

straddle milling



milling



jig drilling
with either micrometer or "Jo" block setting

inspection

Write for free catalog "Erickson Master Spacer" today. And at the same time request your copy of Catalog K; you'll find cost-slashing applications for all Erickson holding tools.

The new Erickson Master Spacer quickly and accurately positions work for a wide variety of jobs. This *one* tool can eliminate expensive jigs and fixtures . . . makes it a simple procedure to set up drilling, milling, boring and special machining operations.

The new Erickson Master Spacer, ideal for tool room and production machining, assures outstanding performance under heavy helical cuts and slow feeds. *Indexing accuracy guaranteed within .001-inch cumulative error on a 6-inch diameter circle.* Jig drilling is possible with either micrometer or "Jo" block setting. Timken bearing construction permits work to be trued in position with brake off because spindle alignment remains unchanged.

The new Erickson Master Spacer can help you come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.

AA-2091

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EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 48

ARE YOUR HANDS COLD?

NO? THEN WHY ARE YOU SITTING ON THEM? If we want to restore this country's economy to the level to which we have become accustomed all we have to do is to get up off it and put more dollars into circulation.

History will attest that the American dollar is a pretty hard working Joe — when he's given work to do. It's only when he's allowed to slow down that we have troubles. He's like a salesman. He can't do a job unless he makes calls — unless he gets around.

Uncle Sam can't spend us out of a recession without extracting a price which we and our children will have to pay through our collective noses. When Uncle engages in deficit spending, he's simply spending our dollars before he gets them.

Here in Cleveland recently a goodly number of dollars were given the hot foot. They were shook up — put into orbit — and, consequently, many of our car dealers were happier than they were a year ago!

The "You Auto Buy Now" week that they staged was an inspiring example of what a fast (circulating) buck can do! People simply bought cars, new or used, that they had been intending to buy later. They blew the whistle on their dollars' time-out and put them back in the game!

The Detroit automakers kibitzed to their great edification, visiting firemen came from many of the country's Chambers of Commerce, with the result that many similar dollar-needling campaigns are brewing.

Now there's a broader campaign about to break — a "Buy It Now" month. It is based on the fact that a lot of families have the money to get a lot of things they want and need, but have delayed purchasing for various reasons. The point is that if enough of us, nationwide, will delay the reasons instead of the buying, those reasons would become past history.

The same goes for management, too. A recent, geographically small-scale survey uncovered $30,000,000 in proposals frozen by management refusal to spend. These are not long-range capital expenditure dollars, but willing workers awaiting the chance to trade themselves in on equipment and supplies vital to efficient operation, product improvement and cost reduction.

It doesn't take much mathematical mumbo-jumbo to project this modest survey across the country and come up with 10 to 15 billion $ Joes in orders approved and ready to place except for top management's current hand warming posture.

Admittedly, our tax structure needs revamping. There are too many tax inequities which discourage our ready and waiting dollars from getting on with the show. These inequities will be remedied in time, legislative time, but we want these stymied dollars to get going now — to get back on their jobs of filling wants, creating jobs, and of "getting to know you".

In this country of world-envied production accomplishments there is nothing less productive than a trapped dollar — whether it's trapped under a mattress or by a management budget that's gone into a state of suspended animation.

There are many eager hands, motivated by the courage of their convictions, willing to project their dollars into a prosperous orbit. If these examples could, by a marshaling of concerted nation-wide effort, so multiply as to embrace all members of our economic community, the results would be wondrous to behold.

Here's the recession philosophy of Charles H. Percy, president of Chicago's Bell & Howell:

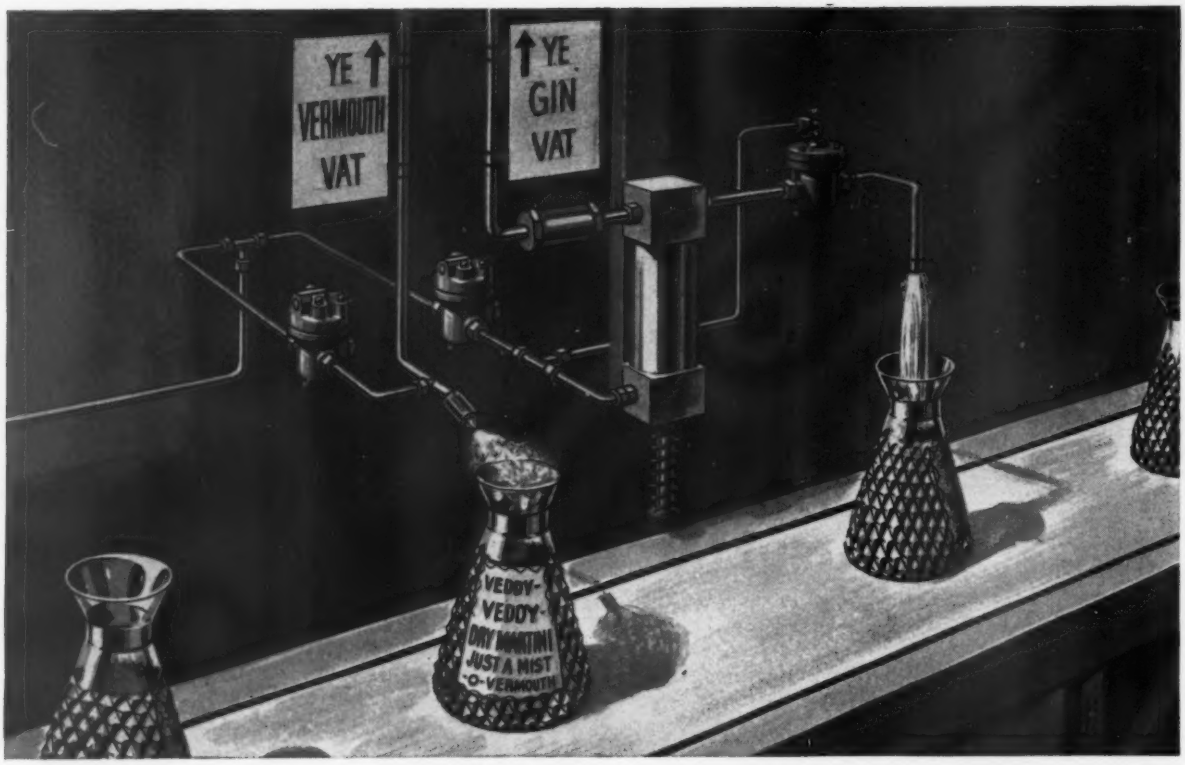
"We're tackling this recession with optimism. We're bringing out new products, cutting prices, increasing advertising, pepping up sales efforts, giving incentives for higher productivity, and putting a relative 'lid' on management salaries. Follow us, if you will."

What a bill of goods! Can you come up with half as good a recession buster? Can you imagine what would happen if that formula would be implemented by Fortune Magazine's list of our 500 biggest companies? We'd be off in an economic blaze of glory that would make prosperous 1956 look like a blighted slum area surrounded by thruway cloverleafs and monuments to Frank Lloyd Wright!

There is, of course, another way to lick this psycho-recession. We have it in these words from Robert Briscoe, former lord mayor of Dublin: "Ireland could never have a recession like America's; we're not prosperous enough." Anybody want a slow boat to Ireland?

E. Willard Pennington

editor



What? Air Automates the Extra, Extra-Dry Martini!

The ready mixed Martini may never come to this but . . .

"Don't bruise the Vermouth!" Maybe you subscribe to the idea of only a fog of Vermouth or maybe you like yours four-to-one.

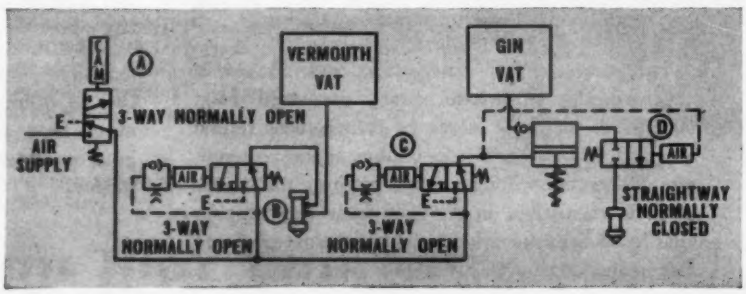
But, if it came to bottling this vogue-ish mixture, the circuit here could certainly do it. Meanwhile it gives us a fanciful way to show you how you can easily create an all air circuit that does a continuous sequence of timed operations by using valves that can be both operated and sequenced by air.

Triggering one operation with another and timing the operating periods—all with air—may save the day for you.

The same air involved in the main operation can also pilot these valves. What's more these valves can be preset to wait out a time delay before operating, or operate for a self-measured time. Using them you can create unlimited all-air automation systems which could just turn the trick where you wish to avoid electricity, or want to stick with just one power medium.

SEQUENCE OF OPERATION

1. Conveyor indexes, opening cam valve (A). This introduces air to valves (B) and (C) which begin timing out. Vermouth is atomized by Vermouth nozzle, cylinder expels a measured amount of gin through master valve (D) which has been opened by air from the outlet of valve (C).
2. Valves (B) and (C) time out and close, stopping liquid flow.
3. Conveyor indexes again.



ROSS OPERATING VALVE CO. 123 East Golden Gate • Detroit 3, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 50

TOOLING & PRODUCTION Magazine

DO YOU KNOW YOUR MACHINE CAPABILITIES?

by

R. B. Nottingham
Reliability Coordinator
Ordnance Division

A. R. Thompson
Senior Q-C Engineer
Brush Instrument Division

CLEVITE CORPORATION
Cleveland, Ohio

THERE ARE FEW AREAS in the shop where profitable information can be obtained more easily than in the study of machine capabilities. Accurate knowledge of machine capabilities results in direct cost savings through the elimination of rejects and the utilization of each machine to its true capacity. Machine tool manufacturers are generally reluctant to quote capabilities for general purpose machines. This reluctance is quite understandable when we appreciate the large part that speeds, feeds, coolant, depth of cut, material, diameters, etc. play in the actual capability.

It is, therefore, necessary for each shop to develop its own capability records based on its own machines on their typical operations. Such records show objectively when a machine does require rebuilding and are vital to an intelligent maintenance schedule. We have done machine capability studies in our shop for some time. We were dissatisfied with the methods used to accomplish these studies. Conventional methods usually require the services of an inspector to take the capability data under the supervision of a Quality Control engineer and considerable time on the part of a statistician to analyze the data once it has been taken.

Employing the general principle that the easier things are to do, the more apt they are to get done, we attempted to develop a new procedure to take the pain out of machine capability studies. This procedure can best be understood by referring to our Machine Capability Work Sheet, Figure 1. We feel that this work sheet is an important contribution and vital to the operation of this procedure. It is designed to be self-explanatory and to minimize errors.

When it has been determined that a capability study should be made, the shop inspector completely fills out the heading of this work sheet. We feel that all the items in the heading are essential and that they do supply sufficient information. The inspector then begins taking measurements on the dimension in question, recording them as shown on the work sheet, and at the same time plotting the individual readings on the work sheet chart at the right. It is important that these measurements be taken with sufficient accuracy to give a minimum of 10 reliable measuring increments within the tolerance range.

In general, a minimum of 50 pcs is recorded and a maximum of 100. One hundred pieces is the preferred quantity and is necessary if the machine shows long term cycling. It will be noted that rather than plotting and recording the whole dimensions, only the deviations from the nominal are recorded. This promotes greater accuracy and simplifies recording subsequent calculations.

After all readings have been recorded and

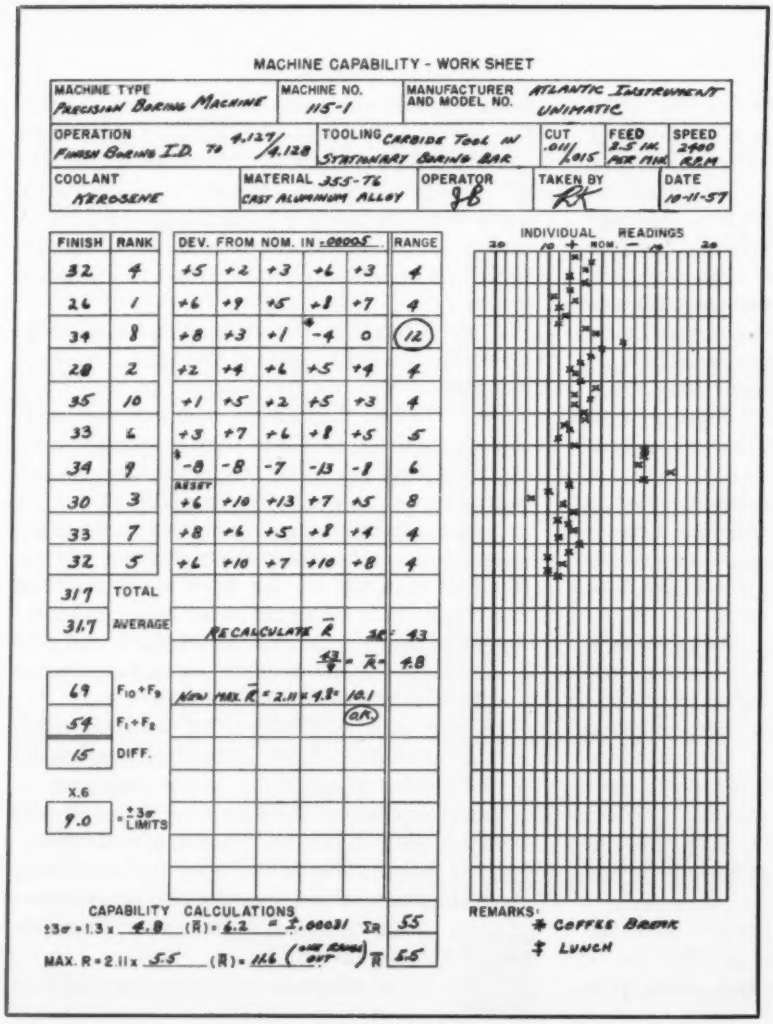
plotted, the range of each group of five readings is taken, summed, and then the average range $\bar{R}$ is calculated. The 3 σ limits as estimated from $\bar{R}$ are calculated as shown and the maximum limit for R is calculated. Any ranges exceeding this limit are circled and the range limits recalculated. This figure is the intrinsic capability of the machine.

It does not include any long term effects of tool wear or any cycling of the machine. If cyclical variations or trends are unavoidable, the amount of this variation should be added to the basic capability. For short run jobs it may often be ignored.

From these same pieces a random sample of 10 is taken and surface finish measured. The Surfindicator readings are recorded in the finish column and ranked from lowest to highest. The difference in these readings is then multiplied by .6 to give an estimate of the 3 σ limit for surface finish. This method of estimating standard deviation from range has proven to be efficient and reliable and is due to Dixon and Massey.[1]

After calculations are completed a machine capability summary card is prepared, Figure 2. A file of these cards is maintained in Quality Control, Industrial Engineering, and the Machine Shop. In our case, these cards are prepared by a Flex-o-writer electric typewriter which can be controlled by perforated tape and which also punches a tape as the card is typed. A master tape is available for the card form. This tape is run through the typewriter and the information for the particular study is added, resulting in a card tape.

This card tape is used to make duplicate cards and is filed with the Quality Control card. When subsequent studies of the same operation are done, this tape is used to duplicate the card and at the same time to duplicate itself. The subsequent study is then added to the new tape, duplicates typed, and the tape refiled.



MACHINE CAPABILITY - WORK SHEET

MACHINE TYPE	MACHINE NO.	MANUFACTURER AND MODEL NO.
Precision Boring Machine	115-1	Atlantic Instrument Unimatic

OPERATION	TOOLING	CUT	FEED	SPEED
Finish Boring I.D. To 4.127/4.128	Carbide Tool in Stationary Boring Bar	.011/.015	2.5 in. per min.	2400 R.P.M.

COOLANT	MATERIAL	OPERATOR	TAKEN BY	DATE
Kerosene	355-T6 Cast Aluminum Alloy	JB	RK	10-11-57

FINISH	RANK	DEV. FROM NOM. IN .00005"					RANGE
32	4	+5	+2	+3	+6	+3	4
26	1	+6	+9	+5	+8	+7	4
34	8	+8	+3	+1	*-4	0	(12)
28	2	+2	+4	+6	+5	+4	4
35	10	+1	+5	+2	+5	+3	4
33	6	+3	+7	+6	+8	+5	5
34	9	*-8	-8	-7	-13	-8	6
30	3	RESET +6	+10	+13	+7	+5	8
33	7	+8	+6	+5	+8	+4	4
32	5	+6	+10	+7	+10	+8	4
317	TOTAL						
31.7	AVERAGE	RECALCULATE $\bar{R}$				ΣR = 43	
					43/9 =	$\bar{R}$ =	4.8
69	$F_{10}+F_9$	NEW MAX. $\bar{R}$ = 2.11 x 4.8 =					10.1
54	F_1+F_2						(OK)
15	DIFF.						
X.6							
9.0	= ±3σ LIMITS						

CAPABILITY CALCULATIONS

±3σ = 1.3 x 4.8 ($\bar{R}$) = 6.2 = $\hat{\sigma}$.00031 ΣR 55

MAX. R = 2.11 x 5.5 ($\bar{R}$) = 11.6 (new range out) $\bar{R}$ 5.5

INDIVIDUAL READINGS

30 20 10 + NOM. − 10 20

REMARKS:

* Coffee Break

‡ Lunch

Fig. 1. Machine Capability Work Sheet. A minimum of 50 individual measurements of the dimension in question have been both recorded (numerically) and plotted. The excessive range of 12 (circled) in the third group of five measurements was due to machine shutdown for coffee break. The lunch period shutdown caused the minus readings in the 7th group. Also shown here are the recalculation of the average range, and the method of arriving at surface finish deviation by using the 1st, 2nd, 9th and 10th rankings, as explained in the text.

[1] "Introduction To Statistical Analysis" by Dixon and Massey. McGraw-Hill.

MACHINE CAPABILITY SUMMARY

MACHINE TYPE — HAND MILLING MACHINE **MACHINE NO.** 12–4

OPERATION — Straddle milling .265 dia. to .187 square flats.

TOOLING — Two 1/2" wide x 5" dia. high speed cutters.

CUT — .080 **FEED** — Hand. **SPEED** — 150 rpm.

COOLANT — Kerosene **MATERIAL** — Aluminum rod type 2024–T4

DATE & OPERATOR	CAPABILITY	SURFACE FINISH
12–10–57 Fletcher	plus/minus .0026	59 max.

Fig. 2. Machine Capability Summary. File cards carrying this information are made available to the Q-C, Industrial Engineering, and Machine Shop departments. With subsequent studies of the same operation, the cards are automatically revised by tape-controlled typewriter.

This procedure assures that current and identical records will be available in all three departments and these records are regularly consulted. It is important, we feel, to include surface finish on each capability study. The fact that the machine may be capable of holding a conventional tolerance may be meaningless unless it can also hold the desired finish tolerances. The material which we have already in file has proven invaluable to us in specifying and planning for controlled finish.

A great deal of information may be obtained from study of the chart. For example, Figure 1 shows a work sheet on a precision boring machine and it will be noted that definite jumps in the setting occur. These jumps correlated perfectly with the morning coffee break and lunch hour and were undoubtedly due to the machine being shut off during these periods.

Needless to say, the machine is now operated continuously during the shift so that the jumps do not occur. Similar capability studies showed that while the operator was religiously dressing his grinding wheel after every 50 pcs, dressing at this frequency was not required. The frequency of dressing was greatly reduced with resulting economy through increased wheel and diamond life.

While we have found that our shop supervision in general knows their machine capabilities well, there have been instances in which they still were putting jobs on machines which were not capable. Also we found that the scheduling group had scheduled work to run in our own shop which we were just not capable of handling.

We feel that only through an adequate record system such as this can the guesswork be taken out of machine capability. Once this capability is put on a scientific and objective basis many new uses for this information are found. As mentioned earlier, we believe that the simple mathematics involved make a substantial contribution through increasing accuracy and encouraging more frequent study.

end

CARBIDE PLATING APPLIED TO GAGES FOR WEAR RESISTANCE

Lincoln Park Industries, Inc. has come up with tungsten carbide coated steel gage blocks with increased wear resistance and prolonged surface life. The method being used to apply the carbide is Linde Company's Flame-Plating process, and one result is Carb-O-Plated steel gage blocks with 50 to 100 times longer wear life than plain steel gage blocks.

Deposition of the tungsten carbide to the base metal — which, with Flame-Plating, may be steel, cast iron, aluminum, magnesium, copper, brass, bronze, titanium, nickel, molybdenum, and other alloys—seldom raises the temperature to more than 400°F during the plating. This practically eliminates any change in the state or properties of the base metal and reduces the possibility of distortion, reports Lincoln Park Industries' President L. W. Howe.

The comparatively low modulus of elasticity inherent in Carb-O-Plate coatings is advantageous for applications requiring high resistance to frictional and abrasive wear — in tool and die shop use of gage blocks, for instance. The thin coating will deform slightly with its base material, without cracking or loosening from the base. This is important because expansion and contraction due to normal working temperature changes do not break down the surface.

The tungsten carbide plated gage blocks have a greater resistance to mechanical shock than solid sintered tungsten carbide blocks. The steel-based blocks, in addition, can be used directly with plain steel blocks without having to allow for expansion differences.

Gage blocks are not the only use for Flame-Plating with tungsten carbide. Inspection gages, non-cutting tools, and precision production parts, some of which could not be made of sintered carbide because of construction restrictions and the breakage hazards, can now be made, using the proper base material, Carb-O-Plated, and finished to gage accuracies and fine surface finishes.

Carb-O-Plating, though extremely tough, has its limitations. It cannot be applied over carbide plate, sintered carbide, or hard chrome plate. For tools and other-than-gage-block uses, small outside and inside diameters under ⅜" cannot be plated economically at the present time. Holes of a diameter smaller than their length can only be plated from both ends with the section between plated depths left void. Narrow holes, blind holes or cavities, and deep V-grooves cannot be plated efficiently.

AUTOMAKERS EXAMINE Q-C IN AIM FOR QUALITY FROM PLAN TO PRODUCT

Whether they actually do it in all their operations or not, the automakers point to man-to-man, operation-to-operation quality consciousness and control if the customer is to get his dollar's worth.

YOU CAN HAVE STATISTICS and inspections galore, but they mean nothing unless linked to the idea that quality control is a major business function that comes to grips with all key aspects of product quality .... We must be quality-minded .... Quality Control must be related to Design, Engineering, Manufacturing, Sales, and Costs ....

These and other similar admonitions indicating that automotive Quality Control people are dead serious in their attempts to give the customer his dollar's worth, even if it means breaking into other departments, came during the recent First Annual Conference of the Automotive Division of the American Society for Quality Control.

Whether because of customer complaints, the fact that the automakers are feeling stronger competition and foresee the need for stricter quality levels, or the fact that their Q-C people just enjoy their work so much that they don't mind a Saturday conference, attendance at the one-day Q-C meeting at Ann Arbor was as sure a sign as the ASQC will ever get that the meeting deserves this annual treatment.

Total Quality Control, the only kind so far as L. N. Bress, Q-C consultant for General Electric Company, is concerned, "starts with the design of the product and ends only when the product has been placed in the hands of a customer who remains satisfied." It must focus on the right quality-cost plane, he added, throughout its entire effort.

With the stage thus set for *total* Q-C, J. A. Parker, A. O. Smith Corporation's Chief Engineer, advanced his ideas on how Q-C and Product and/or Design Engineering should augment each other's work. Quality Control people, he said, have the knowledge of production variations and the techniques for measuring and presenting data for analysis. Product Engineering, on the other hand, has knowledge of the end use requirements of the product. Working together, the Product Engineer establishes the goal or standard for the final product, while the Q-C engineer tells whether these desirable characteristics are achieved and identifies reasons for any failures.

Q-C, then, is useful in helping to modify or improve the definition of the performance specifications — to keep engineering from imposing too rigid specifications or tolerances. All this is a pipe dream, Parker adds, unless both groups are willing and able to work closely together. Engineering must select and define overall and detailed product requirements; Q-C, determine the extent to which these requirements have been met and assess the impact of the end result on the user. Together they give the user the best product for the purpose and price.

Close cooperation and adequate communication is necessary between Q-C and Purchasing, too, according to W. M. Daley, Director of Purchases for the Ternstedt Division of General Motors Corporation. "No other department directly assists the Purchasing Department as much as does Quality Control," he said. With Q-C cooperation, Purchasing can eliminate vendor misunderstanding when vendor-obtained parts fail, for instance, because the Q-C statistical reports pinpoint the failures. GMC vendor rating reports, based on Q-C reports and issued regularly to their vendors, keep suppliers on their toes and interested in giving the company parts to the quality standards they order.

Sample approvals are not enough, said Daley. Vendor reports give suppliers evidence of the company's continuing Quality Control program and incentive to supply parts to meet this continuing quality check.

Bringing the human element into the overall quality picture, Carl J. Demrick added that "checking parts is not enough." "Everyone in the organization must be convinced to think quality and act quality," this Chrysler Corporation Vice President, in charge of Plymouth Division manufacturing, believes. A new function of the Q-C department at Plymouth, a Quality Engineering Section, was revealed as Demrick ran through Plymouth's Q-C line-up. The Quality Engineering Section is an analysis and correction group, supporting the Quality Inspection Section. The result of their efforts is a constant check-up on why quality of any part or department is below normal. Their findings are reported to top management as well as the departmental management involved.

At Ford Motor Company, a Quality Audit Program keeps management advised of the quality of the company's cars, reported F. J. Newton, of the Ford Q-C Manufacturing Staff. Teams of inspectors roving from department to department and from plant to plant, make the checks and record the information included in the thorough audits.

Rising in importance to Q-C are the machine capability studies initiated by machine tool builders, D. N. Smith, Manager of Research at Jones & Lamson Machine Company, told the automakers. They enable the machine tool builder to make sure the machine he is making can meet the desired specifications for dimensional quality. At the same time, they guard the buyer against over-specifying — "buying a machine with far greater capability than needed, at a correspondingly high cost."

Then too, he added, if the machine has been in use for years and scrap parts are coming off of it, machine capability studies can often tell whether a new machine tool is needed, the existing one needs rebuilding, or whether a change in the operation will correct the errors. Machine capability tests and studies, in other words, he maintains, give the machine tool builders and the users a "common language by which to specify, buy, and compare operating notes."

Total Q-C Takes Planning and Training

"QUALITY CONTROL ENGINEERING work is the product of the cross-fertilization of modern developments in several fields — in statistical methodology, in fast response high precision inspection and testing equipment, in management engineering progress, and in understanding the nature of the control function in modern business."

That is how L. N. Bress of G.E. described the work and here, briefly, are the five areas covered in his Quality Control Engineering training program:

1. Study of work elements involved in Q-C Engineering, including vendor evaluations, ratings, and certifications; pre-production quality planning, in-process quality analysis; inspection and test quality planning; design and fabrication of testing equipment; design and fabrication of inspection tools, fixtures, and gages; mechanization and automation of inspection and testing operations; quality level indicating devices; the development and analysis of quality record procedures; quality cost analysis and reduction; in-plant quality control training; quality standards; process capability studies; quality audits and rating; statistical methods; customer quality certifications; and quality instructions and manuals.

2. Study and analysis of quality costs, including quality failure costs, generated by defective materials and products; quality appraisal costs, such as the expenses for maintaining a business' quality levels which result from the operation of formal evaluations of product quality; and prevention costs.

The highlight of this part of the training, according to Bress, should be directed at obtaining the best balance between those three categories of quality costs.

3. An explanation and discussion of the four areas of control, including new design control, incoming material control, product control, and special process studies.

4. A study of statistics, "but only a sufficient amount to enable the trainee to do his quality job more easily and, of course, more economically." Cover frequency distribution, the normal curve, control charts, process capability studies, sampling, etc. Point out, Bress warns, that statistics should be used only to investigate quality and design problems, and for control purposes rather than to substantiate a known fact.

5. The final phase of a Q-C Engineering training program, according to Bress, should be concerned with putting all four of these sectors together and setting up a Total Quality Control Program.

end

SQUIRT WELDING

Ease of operation and freedom from operator strain are seen here. On-and-off and guidance are all that is asked of the welder.

"ANYONE CAN WELD," says Lincoln Electric Company, and they proceed to prove it with their new ML-3, "Mechanized 'Squirt' Welder."

I was handed this gun at their plant recently and told to hold it against the joint formed by two pieces of metal and push the button. This I did, a little skeptical though since I had no mask or gloves and was dressed in street clothes. My skepticism soon turned to amazement, as here *I* was welding. At least they said I was and the gun was sure traveling along the joint, but fast. No sparks, no flash, no effort, no dirt.

Of course I couldn't see what I was doing, as the fluidized granular flux, pouring from the nozzle, kept the welding arc submerged. At the end of the fillet weld I released the button and handed the gun back. Loose flux was brushed away, the metal was hit a blow with a hammer to snap off the solid flux, and there was my masterpiece — a more beautiful fillet weld I have never seen, and I did it. Well, all I really did was start and stop the action.

Operator safety without mask, gloves or particular clothes is shown here. When finished, this fillet weld will be one of the smoothest.

Above is shown a welder at The Republic Structural Iron Works, Cleveland, Ohio, making a butt weld on ¾" steel plate. Other welds on the fabrication shown are ⅜" fillets. Both the butt and fillet welds are made with 550-amp current, the first using a 22 ipm travel and the latter using a 17 ipm travel. The cut weld, having been prepared by scarfs, finishes off flush with the top surface. Republic says they have cut their welding time by more than half when they switched from conventional hand welding to the use of Lincoln's ML-3.

The welder (only the gun is shown here) is a portable unit that consists of: a gun, having a variable speed motor for turning a multi-point drive wheel; a 15′ cable, which carries the flux, wire, and current; and a cart with a tank for 100 lbs of flux, controls, and the automatic wire feed mechanism.

Any surface travel between 0 and 70 ipm is available by pre-selection. This rapid welding speed is due, in part, to the continuous flow (or squirt) of welding wire. You should see this and consider its advantages in respect to your production picture.

— William E. Hoffman
Associate Editor

Q-C Goes 100% Automatic

by Clifford W. Kennedy
Supervisor of Training
FEDERAL PRODUCTS CORPORATION
Providence, R. I.

DURING THE PAST DECADE, many of the best laid out and highly workable Quality Control Systems, using unimpeachable statistical techniques, have found themselves snagged by several hookers common to practically every manufacturing establishment. Too much attention has had to be paid and energy given to offsetting these failures. Too often, a compromise has had to be made with desired quality.

Within the last year or so, however, automatic equipment has been developed for dredging these particular quality channels clear. The statistically correct becomes practical, and parts can be produced with a yield about as close to 100% right and defect-free as you would have them. Unit cost, scrap, rework, yield figures, quality levels, each or all, become as actual in the tote box or on the skid as they appeared theoretically on paper. Oversized inspection payrolls also shrink in this modern, pushbutton, automatic quality control conception.

One of the several snags which seemingly clog the channels of a quality control system is the human element which so many times seems to result in samples not being taken on schedule. The underlying cause may or may not be legitimate but the work doesn't get examined and the day's output becomes contaminated with a higher percentage of substandard than is reasonable.

On the other hand, suppose a check-up shows that inspections are made exactly on the statistically prescribed schedule. The human element will many times then show up in another shortcoming which dilutes the initially well developed, accurate system of quality control. For example, the system calls for the examination of a certain number of pieces (the prescribed sample size) taken at random from work completed since the last inspection. It seems to take either a high order of determination by the inspector or an unusually propitious set of physical circumstances in order to get a truly random sample. The quality system is usually short-changed by samples skimmed off the surface or cut down to some convenient number that has no realistic connection with the relevant statistics. For that matter, what do you do about getting a 31-piece sample every half hour from work that is constantly moving away from a high speed machine by conveyor and into the parts washer?

Assuming the Quality Department has managed, by dint of persuasion and persistence, to have suitable samples of work secured at the specified times, there is still another manifestation of the human element to cope with. Are all the required observations, measurements,

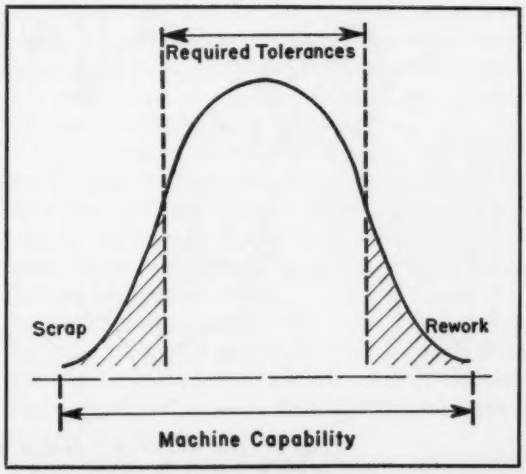


Fig. 1. This well-known bell-shaped curve of his machine's capability is why an operator ends up talking in his sleep; 68% intolerance work with the balance either scrap or rework.

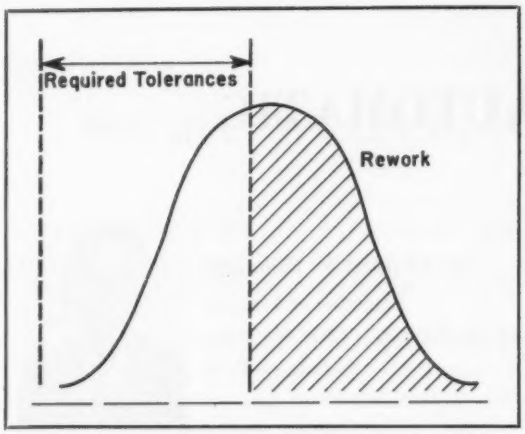


Fig. 2. An optimist's solution to the condition shown in Figure 1. The tolerance-happy operator resets his tooling to the high side so that all rejects are oversize. That leaves him with the hope that he may get a chance to rework them.

and tests being faithfully made on each piece in the sample? Are the results accurate? Is the inspector correctly defining a "defective" or does fatigue introduce compromise?

You have to deal also with the inspector who has "got religion" — who can spot ten millionths of an inch undersize a mile off. Overdiligence in unnecessary rejections bothers the quality executive sometimes more than everyday lenience in inspection.

And here's another Q.C. "snagger": Probably no one in the quality control business who came up through the throes of being a floor inspector has missed the situation where definitely undersize, oversize, or substandard work was clearly pointed out to the operator only to have him stare back, unblinking and unsmiling. Without a word he turns stiffly to his machine and continues to produce exactly the same kind of work.

The operator's attitude may be only the symptom of deeper disorders, as quality control people know. His production quota has been undoubtedly set by some degree of time and motion activity. He knows that by the end of the hour, certainly before the shift is over, he must have completed a required number of operations or made a certain quantity of pieces regardless of their exact quality. The basic trouble in this situation is the failure to allow enough time in production cycles for adequate inspection.

Add to this the frequent clamoring "to get the stuff out", even if the batch contains one or two percent above normal defective. Further, who likes his department tarred with an unsavory scrap record?

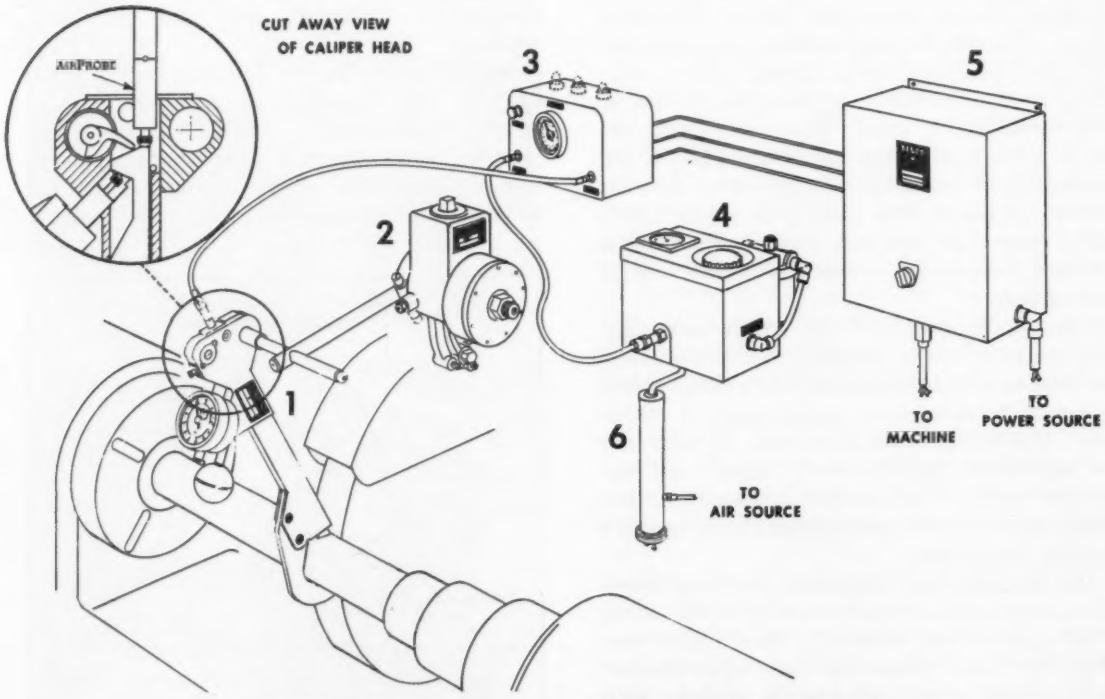


Fig. 3. One system of in-process gaging wherein the gage monitors the grinding, just as the operator might, and signals the machine to stop when the work becomes within tolerance.

The combined units: (1) grinding gage with adjustable caliper; (2) hydraulic mount; (3) air-electric switch; (4) air regulator and filter; (5) signal control unit; and (6) oil and water separator trap.

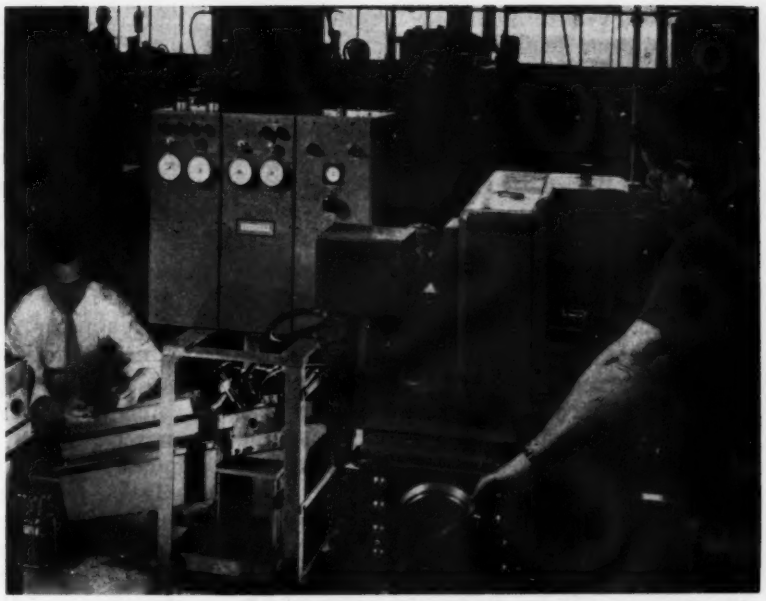


Fig. 4. An installation of post-process gaging where each piece is automatically checked for dimensions directly or soon after it has been machined. Photo courtesy, Link-Belt Company.

The experienced quality control engineer knows that effects of the human element go still deeper and that his systems often face defeat because there has been no replacement of obsolescent, arthritic machinery incapable of producing to required tolerance.

Little wonder that an operator turns back to his machine, wordless, with small hope, when the inspector shows him offsize work. He knows the best the machine can give him is little better than 68% in-tolerance work, Figure 1. He sets to the high side, instinctively, as in Figure 2, to make all rejects oversize — none undersize — with the hope that he might get a chance to rework them.

The conflict between machine capability and blueprint tolerances is illustrated by the well known, bell curve distribution of Figures 1 and 2. But a better illustration, in words, appeared in this magazine several months ago, in the fable of a man who insisted on driving his car into his garage though the car was 6″ wider. He had his fenders repaired not just once, but after each of three repeated tries at his narrow doorway. Then the men in the white coats came to get him. The psychiatrist found that he was a plant manager who insisted on putting 0.001″ tolerance jobs on machines capable of nothing better than 0.002″.

Having battled with Production's determination to deliver the required quantities on schedule, and having used every trick of psychology and salesmanship he could think up to enforce his statistics, the quality man turned to 100% inspection. But here again he struck a snag.

He rapidly discovered that 100% inspection is not 100%. On the average, screened batches come out only 85% clean. Even under the best conditions, inspectors find but 95% of the rejects; 5% defective still contaminates the batches. He also finds that routine screening is expensive on the payroll side. Sometimes manual sorting costs more than the parts are worth.

Today, however, the quality control man can get help. Modern technology has stepped in to relieve his dilemma, at least those elements of it implied in the foregoing. He can secure pushbutton equipment to give him the results and quality levels in output he desires, and automatically. Described below are three examples of many variations and designs of automatic gaging to which he can now turn. Such equipment, properly selected and applied, not only helps to improve quality but lessens the cost of obtaining it.

One hundred percent inspection by automatic gaging originally came into vogue to take the hand work out of screening long runs and to eliminate bottlenecks. While many know that automated inspection eliminates human inspection errors, it is not as generally realized that recent developments have brought out gages which can "think" as well as act. They include the added function of control over a process; a control that can be varied to suit the need.

One class of pushbutton gaging equipment uses the gage on the machine to continuously measure the work. It is often referred to as an in-process gage. The sketch in Figure 3

outlines one system of units combined for in-process control. In this role the gage monitors the machining, just as the operator might, and signals the machine to stop as the work reaches desired size. At this instant in the machining cycle the gaging function is interrupted until the next cycle.

At first glance we seem to have the ultimate, in that every piece turned out would be acceptable. Thus any further inspection or the need for statistical quality control would be eliminated. This is in large part true, as long as results are checked regularly (usually once or twice per shift) to make sure that heat generated by tool wear and metal removal has not increased the gage temperature sufficiently to cause a drift of part size too far toward the tolerance limits.

Figure 4 and the block diagram of Figure 5 illustrate post-process gaging, where each piece is automatically checked for dimensions directly or soon after it has been machined. Here we have the typical feed-back situation where the gage may stop the machine or signal a suitable correction or simply offer a red light warning to the operator.

Post-process control has the special faculty of detecting drift. This is illustrated, quality control style, in Figure 6 which shows how the dimensional distribution of the work shifts in the course of time, due usually to tool or wheel wear. Ordinarily an operator starts machining an OD at the low end of the tolerance, as at A in Figure 6, although here the feed-back gage will warn of an approach toward undersize work as at U. As the machine runs steadily, its distributions drift toward the upper tolerance, like B and C in Figure 6; and, again, the gage can be set to signal, as at O, before oversize work appears.

In addition, the user soon learns that post-process control gages make an economic application, especially on an older machine, because they can be set so as not to force unduly frequent machine shutdowns, and offer the screening and timing features described in some detail below.

Post-control equipment, as Figures 4 and 5 indicate, can and will also automatically screen the output of the machine free from rejects. In other words, it offers a Sunday double header on one ticket. It serves as a floor inspector, taking samples and giving automatic warnings of quality deviations, and then takes the place of a squad of girls sorting out unsatisfactory parts.

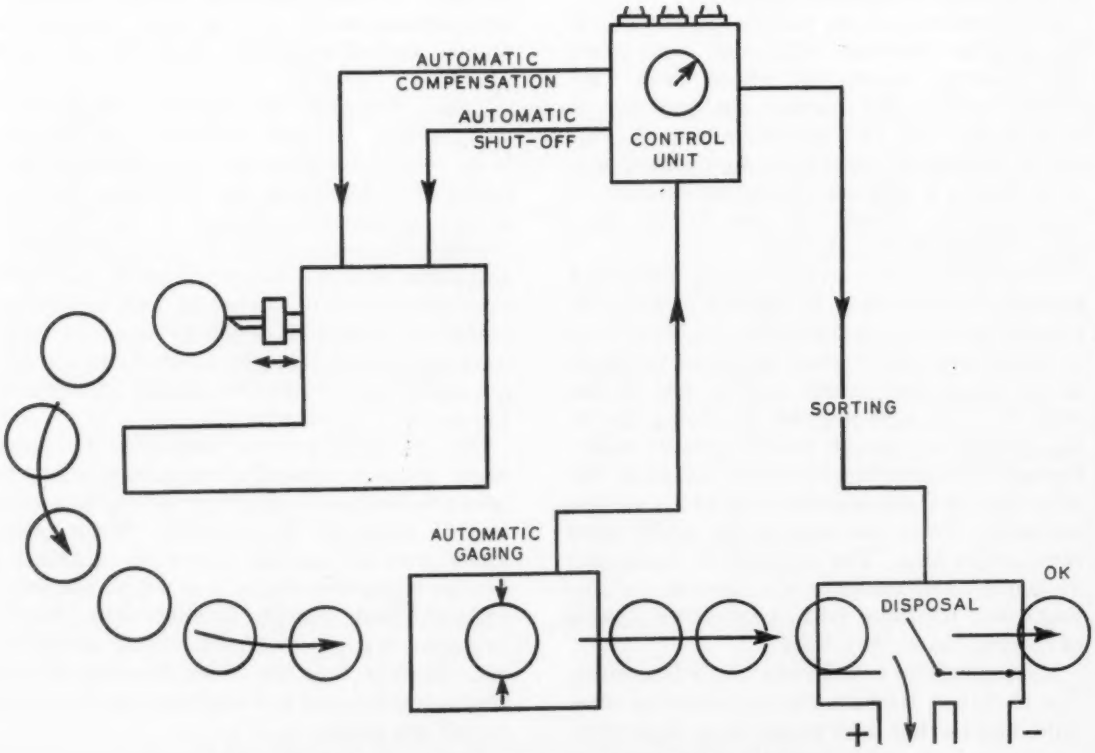


Fig. 5. Block diagram of post-process gaging. The feed-back from the automatic gaging station to the control unit triggers either automatic compensation or automatic shut-off. The workpiece flow is so paced and spaced that the sorting and disposal functions are "alerted" to an oncoming workpiece in terms of okay, oversize or undersize.

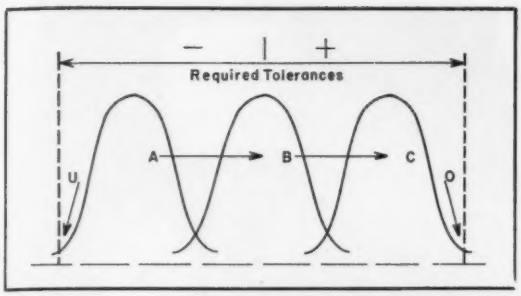


Fig. 6. Automatic post-process gaging discloses any drift in dimensional distribution over a period of time. This is due usually to tool or wheel wear. Information from the gage is fed back to warn of an approach to undersize work, as at U, or to oversize, as at O.

In his consideration of pushbutton help, the quality control engineer can go further. He can rely on timing and counting devices, which can be added to a post-control gage, which will, for example, stop an offending machine when either or both of two conditions arise — one based on percentage, the other on time.

Figure 7 pictures such control equipment accepting machined parts by conveyor from six machines. The gage keeps the parts from each machine separate, tallies the gross production from each machine, and makes the required measurements on each piece. It also notes and tallies the rejects.

Depending on a desired economic quality level (minimum machine shutdown and adjustment, plus tool wear, versus a maximum of acceptable parts), the gage control is set so that when a certain count of offsize pieces per machine has been noted (like 4 out of 24 pcs produced), the machine is automatically stopped, the operator makes incremental adjustments and starts the machine up again.

If, however, he neglects the adjustment, the gage also functions so that after a certain number of rejects per machine are observed in, say, 30 min, it will stop the machine automatically. Then the machine can be restarted only by unlocking a pushbutton on the gage panel. The key is the property of the foreman. Thus, any inattention on the part of the operator, or any machine inadequacy, quickly brings about supervisory attention.

This arrangement is unique in that it attacks the human element problem head on. The gage accomplishes continuous sampling control on the basis of reject percentage, and, on the basis of time effects, batch sampling. Simultaneously, with a sensible adjustment of the gage's screening function, the rejects are sorted out and the desired, economic reject or quality level can be strictly maintained in the output of each machine and gage, all with due consideration of machine downtime.

One generality should be offered concerning automatic gages. They don't tire or demand a coffee break. They never resent a bawling out. You never see them come in with a grouch in the morning after a fight with the wife. They don't anticipate the quitting bell. Given a little intelligent maintenance, they'll click along faithfully, steadily, uniformly, 24 hours a day.

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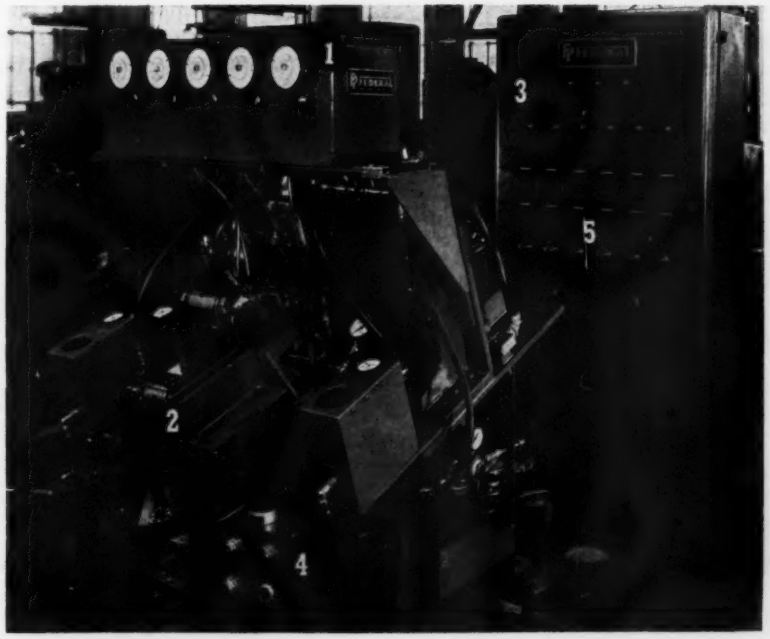

Fig. 7. This single gage, post-process setup automatically controls outputs from six screw machines. Outputs are fed sequentially. The gage automatically checks five dimensions on each part, sorts into "good" and "bad", and halts the operation of any one of the machines whenever its AOQL (average outgoing quality level) rises above a prescribed percentage.

The system's components: (1) five air-electric indicators for the respective dimensions being gaged; (2) inspection chute—good pieces continue on for subsequent handling, but rejects drop through a gate in bottom of chute; (3) upper three lights indicate the part being checked is either "good", "over" or "under"; (4) indicating unit for each machine operator — small lights show when a part from his machine is being gaged and whether "good" or "bad" — dome light flashes when machine has been stopped by gage; (5) "good" and "bad" counters for each of the six machines and supervisor's re-cycle buttons.

Aro Controls Torque for High Altitude Oxygen Regulators

ONE OF THE MAJOR FACTORS in Aro Equipment Corporation's quality control program is making sure that the tiny valves, valve seats, and plugs placed in the bodies of the high altitude oxygen regulators they make are set with just the right amount of torque. Too little torque can cause a leak; too much can cause the regulator body to crack.

In a typical oxygen reglator there are three critical torquing points: The first is the pressure regulating or inlet valve, with an O-ring seal. This valve, which controls the pressures at which oxygen is delivered, is placed in position at a torque of 150 in-lbs.

The second critical point is a valve seat, which, if faultily placed, can cause damage either to the aluminum cast regulator shell, or the seat itself, causing an oxygen leak. This part is placed under a torque of 350 in-lbs.

The third important area is a ⅛" sealing plug, which fills the entrance to the inside of the shell. Overstress on this part can cause body cracking. It is torqued to 80 in-lbs.

Torque wrenches, of both the dial reading and pre-set type, are used on the assembly line to perform these delicate operations. The wrenches are carefully checked for torque accuracy prior to use on a Skidmore-Wilhelm torque wrench calibrator.

A dial reading torque wrench is tested for accuracy on the Skidmore-Wilhelm torque wrench calibrator at Aro Equipment Corporation.

This instrument, manufactured by Skidmore-Wilhelm Manufacturing Company, is a portable, hydraulic device which makes direct gage readings of torque in inch- or foot-lbs.

The tool tests are performed in the tool room, by inserting a wrench lug into the instrument, then torquing to the proper reading. On a dial reading torque wrench, the wrench dial must correspond exactly with the hydraulic gage on the instrument. Pre-set torque wrenches are tested in the same manner, and must register on the instrument gage exactly the reading specified by the manufacturer. Any variation means the wrenches must be adjusted or repaired before they can be used on the assembly line.

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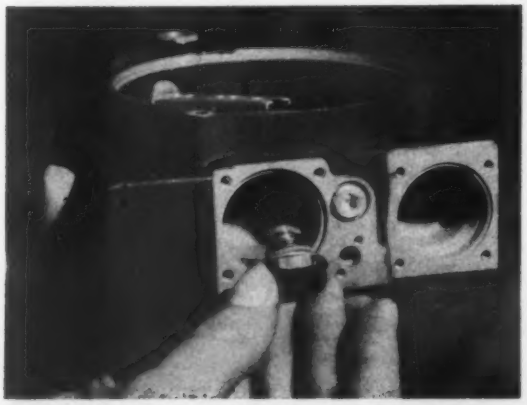


Pressure inlet valve for oxygen regulator apparatus is placed in position, then torqued to 150 in-lbs by a pre-set torque wrench.

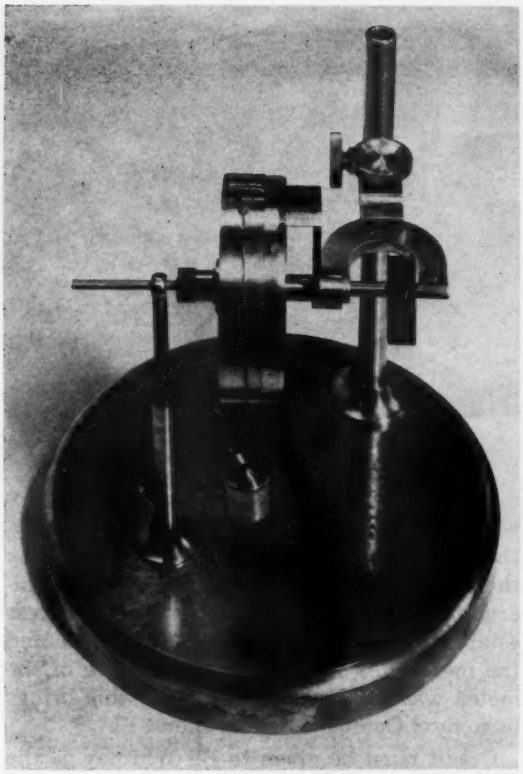


Fig. 1. Carl Edward Johansson's original measuring machine which he devised for checking the size and parallelism of his early measuring blocks. To a Brown & Sharpe micrometer caliper (of 1855) he added the large graduated drum and weight. The large drum permitted generous and easily subdivided graduations and the weight applied constant torque to the spindle screw. To further reduce variables, the contact end of the spindle was slightly spherical and the stationary anvil was serrated.

From Cubits to Millionths

by Milton E. Ellis
Precision Tool and Gage Group
BROWN & SHARPE MFG. CO.
Providence 1, Rhode Island

DURING OCTOBER 1958 the International Committee on Weights and Measures will consider a recommendation to redefine the meter by using the gas, Krypton 86, as the reference source of light wave length. The meter will be defined as 1,650,763.73 times this wave length. This will be more than 100 times as precise as the present international meter, cannot be destroyed, and can readily be duplicated.

This is a far cry from the days when the ancient Egyptians used parts of the human body as units of measurement. The distance from elbow to the tip of the forefinger was called a cubit (about 20″). The width of a finger was a digit (from .72″ to .75″), and the open hand was called a palm (about 3″). Later, the Olympic Cubit became a "foot" and was divided into 12 thumbnail widths. The foot was adopted by the Romans and later by the British. Two outstretched arms represented a fathom, (4 cubits or 6 ft).

In 1856 new Imperial Standards were distributed by the International Bureau of Weights and Measurements to various countries. The United States received 2 of 30 master bars. These bars are No. 20 and No. 27 and were compared with the accepted 36″ on

Fig. 2. A portion of Brown & Sharpe's new and enlarged, constant temperature, facilities for the manufacture and checking of Johansson gage blocks.

the Troughton Scale. They were approved by the Office of Weights and Measures as standards for the United States. In 1866 Congress established the ratio between the inch and the meter. As late as 1927, the length of the meter was redefined and, briefly, this brings us to next October's deliberations.

Credit must be given to Eli Whitney as the father of mass production. In 1798 when France threatened our country, he offered to manufacture several thousand stands of arms. His success was based on mass duplication of parts, for which a thousandth part of an inch was considered a close tolerance.

Nearly a century later, with the problems of interchangeability affecting Swedish production of arms, Carl Edward Johansson became the father of precision measurement.

In 1896 after years of perseverance he successfully made the first set of the now famous Johansson measuring blocks. His problems were many, not the least of which was to persuade industrialists, scientists, and governments to agree on two basic norms of measurement.

First, a standard temperature, and second, a practical meeting point between the English and metric units of measurement. He started something which is still unfinished, for minute variations in the inch and the millimeter still exist between some nations.

Measuring his gage blocks was not the least of his problems, and with humble pride we record that he selected the improved Brown & Sharpe micrometer caliper of 1885 for his basic measuring instrument.

The photograph, Figure 1, of the original measuring machine shows the micrometer with his ingenious addition of a graduated wheel to which has been added a weight, to exert a constant pressure, and also a serrated anvil.

Many of the first gage block sets manufactured in Sweden are in use in this country today and they are returned to Brown & Sharpe, the sole U. S. manufacturer of Johansson Gages, for calibration. They are surprisingly accurate and, after having withstood the test of time, are prized possessions of their owners. When millionths accuracy is a must, they rely on their Johansson gages and consider them their own "Bureau of Standards."

At the turn of the century, the science of precision measurement was beginning to take hold and in 1901 the National Bureau of Standards was established. It had at that time custody over two primary standards of physical measurement, the meter and the kilogram.

The length standard is a bar of platinum irridium alloy and it defines the meter. From it units of inches, feet, etc. are derived by numerical ratios. This meter was recently taken to Sevres, near Paris, France, to be compared to the master international meter, produced by the International Bureau of Weights and Measures. More recent developments have made it unnecessary to depend upon this physical meter.

Interferometers using certain wave lengths of light now measure to an accuracy of one or two millionths of an inch. Recent progress at the Bureau of Standards makes measurements to a tenth of a millionth look possible in the near future. For whatever it means to future scientists, we are told that an angstrom unit is somewhere near 4 billionths of an inch. In case one is not familiar with a millionth of an inch, consider a human hair split into 3,000 parts. Each would measure a millionth part of an inch. A tenth of a millionth would be 1/30,000 the thickness of a hair, and the angstrom unit we'll leave for you to figure out.

Brown & Sharpe Manufacturing Co. in 1948 purchased the manufacturing rights to Johansson Gage Blocks and accessories in the United States, and set up a modern air-conditioned facility for the manufacture and calibration of gage blocks and accessories. Now, only 10 years later, completely new and enlarged quarters, Figure 2, constitute the home of these famous gems of precision.

The price of these gages used to be such that only large concerns could afford to use them, and then mostly in inspection departments. It was common practice for the shop foreman to lock a set up in his desk, to be taken out only when questions of accuracy arose. This was like locking the barn door after the horse was stolen.

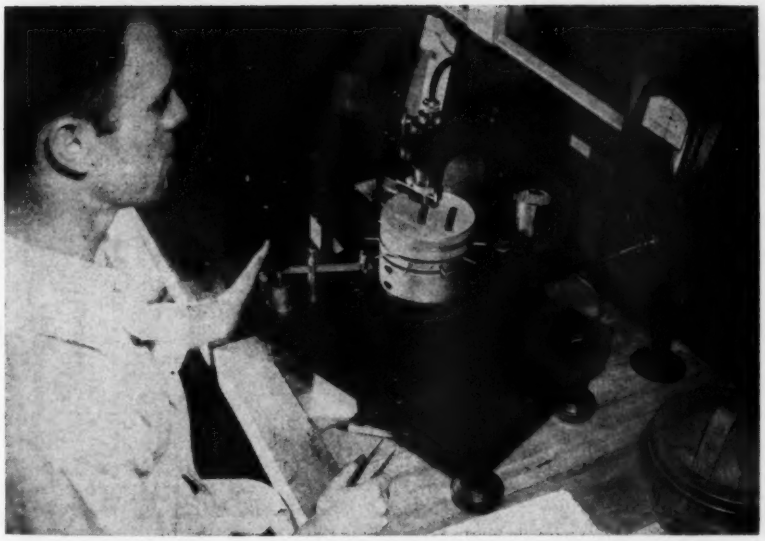


Fig. 3. Today, to measure Johansson gage blocks during production, Brown & Sharpe uses this setup with an electronic comparator working at a magnification of 100,000 to 1.

Users wanted gage blocks with a close tolerance but at a price which would allow them to be used commonly throughout their plants. In other words — *to use* — not to look at. Also, manufacturers realized that with precision tools a comparatively unskilled workman can produce more and earn more.

Brown & Sharpe first attacked this problem by setting a price which would be attractive to and within the reach of even the small job shop, i.e. blocks of approximately half the "B Quality" in price, but still maintaining "B Accuracy." Reducing prices is *not* the trend today and in this particular field, we came to appreciate some of the difficulties which C. E. Johansson must have gone through.

However, after many months of striving on the part of a management and engineering team the "Thrift Block" was born and has made the famous "Jo-Block" a "workman's tool with millionths accuracy."

Now, two years later the tolerances of "thrift blocks" have been reduced to below that allowed by the Bureau of Standards for "B Quality" blocks and the price has not been increased.

The higher quality AA, A, and B blocks are still being manufactured both in steel and chromium plate for the higher precision and inspection operations.

To measure these blocks in production, an electronic comparator, Figure 3, is used with a 100,000 to 1 magnification.

Grand Master sets from which Master Sets are calibrated are checked for accuracy at the National Bureau of Standards, the legal authority over measurements in this country.

Flatness of the blocks is checked with an optical flat under monochromatic light. Each dark band seen represents 11.6 millionths of an inch.

Surface finish is checked with a surface finish analyzer and an interferometer comparator. While a good finish is important especially for interferometry, care must be exercised not to create excessive pressure and surface heat during lapping which causes the surface to flow and makes the ambient layer more subject to scratching when in use.

The average hardness of Brown & Sharpe Jo-Blocks is 67-68 Rockwell C.

In addition to the new manufacturing facility previously mentioned, Brown & Sharpe maintains one of the finest and best equipped metrology laboratories in the field of precision measurement for use in checking instruments which the company manufactures.

Of course, we often assume every one knows all about gage blocks and their use, but before closing let's review a few of the uses for these gages.

By a phenomenon known as molecular cohesion (wringing), combinations of the popular 84 block set can be wrung together into over ½ million different master standards for use with comparators, for checking master gages, for use with sine bars for checking angles, or with accessories for many measurements which can be taken directly with millionth accuracy.

They may be made up into super-accurate height gages or used simply to check micrometers.

In all, they place the large and the small shop on the same basis precision-wise. end

High Volume Production Problem Solved by

INGENIOUS PRESS AND TRANSFER DIE

by Frank Brandes, Jr.
THE BRANDES PRESS COMPANY
Cleveland, Ohio

UNIQUE NEW PRODUCTION METHODS and specially designed equipment, developed as a joint effort by The General Electric Company and The Brandes Press Company, are being used by General Electric in the production of wall outlet grills for air heating and cooling ducts.

Originally these grills were composed of several individual parts that were assembled into units and then production welded together.

In an effort to increase the production rate for these grills, and at the same time effect a savings in material and labor, the solution to the problem was found in a Brandes 350-ton, wide bed, double geared, automatic press equipped with a specially designed eight-station progressive transfer die. By utilizing the many advantages afforded by progressive tooling and incorporating ingenious new features, high-volume continuous production has been made possible. The objectives have been

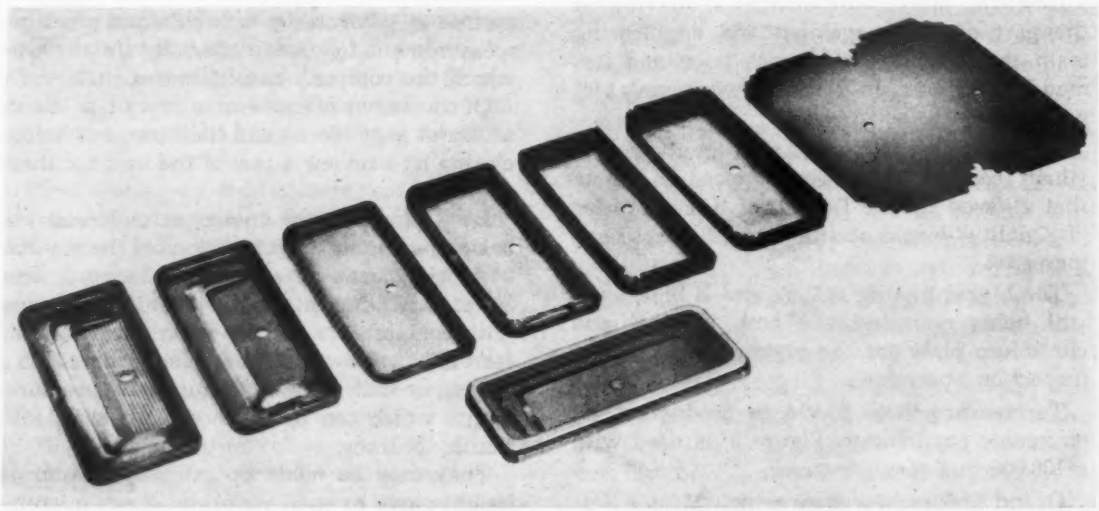


Fig. 1. At Station No. 1 the corners are trimmed and a center hole punched. Starting with the view at the right, the shape of the blank after notching and trimming to width in station No. 2 is shown. The successive views show the form imparted to the grill in stations No. 3 to No. 8 inclusive. The finished grill is shown at the bottom.

Fig. 2. The coil cradle and straightening machine is shown feeding coil stock to the press. Air cushions can be seen mounted on the large flat platen. These supply all draw and hold-down pressures. This convenient arrangement permits easy adjustment of drawing pressures.

met and in addition the grills now are more uniform and take a better finish.

Finished grills, as shown in Figure 1, measure approximately 6" x 16", with two louvers formed on the face. The entire edge is rolled and U'd so that a gutter is formed along the entire inside edge of the grill to accommodate a gasket seal.

The Brandes automatic press as shown in Figures 2 and 4 accommodates a die 34" wide x 82" long. A large flat top platen area makes possible the installation of air cushions whereby all draw and hold-down pressure is supplied. This permits easy adjustment of drawing pressures and eliminates the use of springs. Although the die is centered in the press, the load is far off center, but the patented Brandes V-way guides give rigidity and precision alignment of the press maintaining the die in accurate alignment for high production.

Ingenious design of the progressive and transfer type die makes possible maximum utility of the Brandes press. Steel coil stock is fed to the press by a Brandes combination coil cradle and straightening machine as shown in Figure 2. The stock is taken into the press through Brandes standard ingoing roll feeds as shown in Figure 4. At die station No. 1, corners

Fig. 3. Closeup of the die — first station is at extreme right. After trimming and notching at stations 1 and 2, the blank is piloted, cut from the strip, and the first draw made at station 3. The drawn part is then moved through the succeeding stations by the transfer mechanism.

are trimmed and a center hole punched. At station No. 2, the blank (still on the strip) is piloted, corner notched and trimmed to exact width. After these first two operations, the die then becomes a transfer type die for the next six operations, completing the parts.

At station No. 3, the blank is piloted, cut from the strip, General Electric name stenciled, and the first draw made. In cutting the blank free from the strip, the shear is controlled by an air cushion on top of the press. A trim on one side of the blank to obtain correct width is the only scrap in the making of this part. The drawn part is now easily picked up and moved to the remaining stations by the transfer mechanism. At station No. 4, the part is curled on all four edges and on the corners by positive operated cams expanding on the inside of the die. The stock is held down by air cushions to eliminate any variations in dimensions.

At station No. 5, the grill is flattened and the edge of the gutter is curled. Again, an expanding cam unit, air cushion controlled, is employed. At station No. 6, a final forming operation is performed using an expanding cam unit, air cushion operated. At station No. 7, the first louver is cut and formed, and two small mounting holes finish-formed. At station No. 8, the second louver is lanced and formed, the front panel of the grill and the surfaces around the mounting holes are embossed. The grill is then automatically removed from the press in correct position for assembly of control button and painting in one continuous line operation from the press. As the mechanism of the transfer device is included in the die and bolster plate, the entire unit can be removed in one operation so that other progressive dies or transfer dies can be installed on the machine.

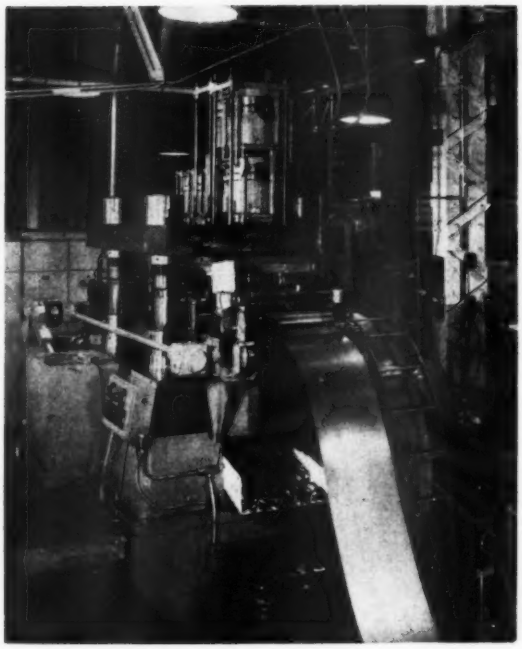


Fig. 4. Close-up of stock being fed to press by Brandes standard ingoing roll feed.

Air cushioning is used wherever possible to eliminate the danger of die damage from spring failure. All stations and various parts of the transfer mechanism are protected against damage by micro-switches on safety pilots. In case of a misfeed, the clutch automatically disengages. All stations are on individual blocks, mounted in a master three-pin die set, making it unnecessary to remove the complete die for adjustments. The entire die is constructed of Uddeholm Swedish tool steel. Sturdy construction of both press and die makes possible continuous, uninterrupted low-cost production of top quality grills.

end

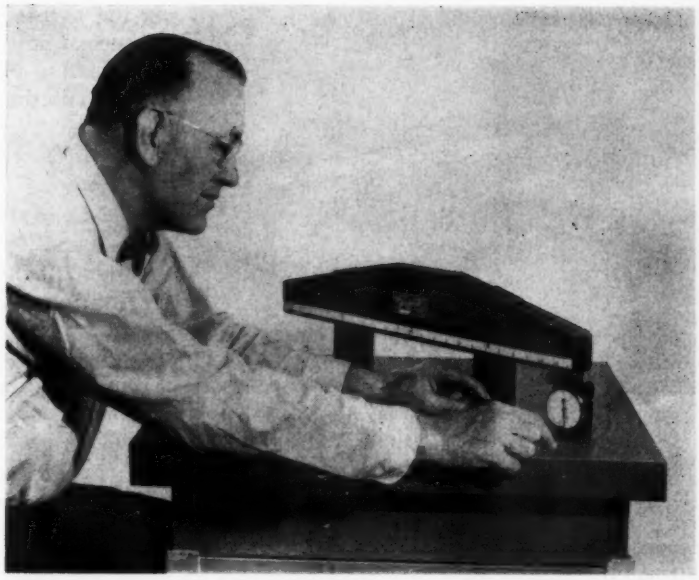
The Winnah

ENGINE MANIFOLD REDESIGNED TO STAMPING SAVES $70,000/YR

Redesign and a switch from a casting to an 18-ga steel stamping is saving Mack Trucks' Engine Division some $70,000 annually, and merited for the firm's Jack F. Greathouse the 1958 John Woodman Higgins award of the Pressed Metal Institute.

The redesigned diesel engine inlet manifold is made up of two symmetrical stampings welded together. The finished part offers a smoother surface than the previously cast manifold did, and saves 8 lbs of weight per part.

American Stamping Co. received an honorable mention at the PMI's Spring Technical Meeting for redesigning a stanchion used in cattle barns as a stamping. Morrison Steel Products, Inc. did likewise with an aluminum lawnmower housing; and Scovill Manufacturing Co., with both a lawn sprinkler extension and a garden hose connection. Over $1,100,000-worth of savings through the use of stampings were entered in this year's competition, according to Carter C. Higgins, president of Worcester Pressed Steel Co., who presented the awards.



R. J. Rahn, developer of the Planekator demonstrates a typical setup. Note the tape along the bottom of the straight edge. The inch marks along the tape aid in positioning the indicator to the desired pattern of calibration. See Figures 5 and 6.

CAN YOU PROVE (?) THE FLATNESS (?) OF YOUR FLAT (?) SURFACE PLATES? HERE'S HOW:

by E. Willard Pennington
Editor

METROLOGICALLY we speak a bit loosely when we call the great galaxy of measuring tools, instruments, and gages with which we exercise Quality Control, precision tools. Actually, these tools are only as good as their known errors — their deviations from accepted standards of accuracy.

The job of determining (or coming to know) their errors is called calibrating. This consists of measuring and recording the deviations so that when the tools are used for their respective measuring purposes we have a correcting factor to apply to the values they presume to give us.

Calibrating is essential on two counts: (1) to determine a measuring tool's departure from truth throughout its range, and (2) to measure and locate the effects of wear.

In many plants there are highly formalized programs for gage control. All gages and in-

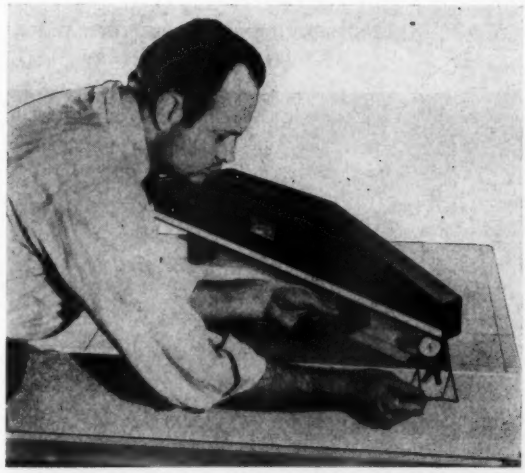


Fig. 1. Here the operator is adjusting the Planekator for the first, or northwest/southeast, diagonal. The pencil lines on the surface plate serve as the calibration pattern and to locate the points where recordings of the indicator values are to be made.

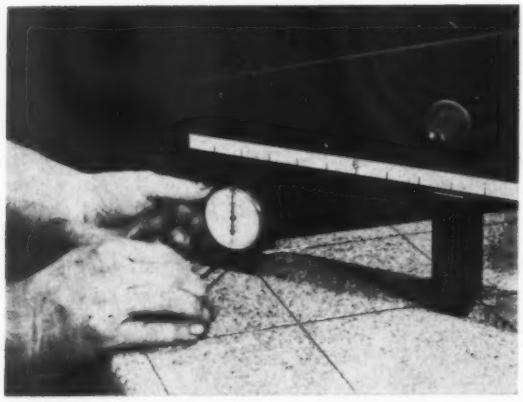


Fig. 2. Taking the indicator reading between the Planekator and the surface plate at the point representing A in Figures 5 and 6.

struments are subjected to periodic checks and recorded findings. This involves all types of inspection equipment.

Jo-block sets are frequently sent out for calibration and replacement of blocks that have worn beyond tolerance. Micrometers are checked against standards, and these standards are, in turn, checked against masters. Snap gages, plug gages, and gaging fixtures are all periodically checked.

A gage control program is a continuing battle against the effects of wear, mishandling, temperature, humidity, vibration, and the inherent relative instability of materials.

Probably the most basic (and hence essential) tool for attaining precision measurements in the shop, inspection department, or gage control laboratory is the surface plate. It is supposed to represent a true, geometrically plane surface upon which we can rest both the workpiece and gage involved in measuring or checking a given dimension.

We call this supporting area, or surface plate,

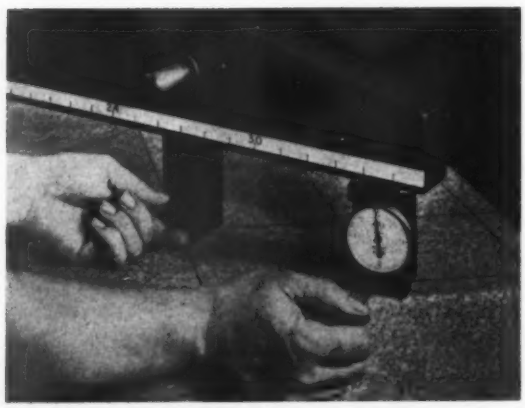


Fig. 3. Manipulating the Planekator's adjustable support so as to get equal readings under the two ends of the Planekator. Even a beginner can get an equality of readings in two or three tries.

the reference plane because in making the measurement from it, it must represent the "starting zero" for the dimension being measured on the workpiece and for the dimensional scale or measuring range of the gage which gives us the value of the dimension which we seek.

Obviously, both "starting zeros" have to be one and the same, they have to lie in the same plane, hence the need for supporting both workpiece and gage on the true, geometrically plane surface of our surface plate, which we must assume as being "zero" all over. That this is a dangerous assumption is implied by the abundance of question marks in the title of this article.

Lord Kelvin (1824-1907), the eminent British physicist and mathematician, said "If you can not measure, you do not know". His words are as true today as when spoken. How could we know the orbit of a satellite if we couldn't measure a succession of its positions in space? By the same token, how can we know the flatness of a surface plate unless we can measure it? We can't!

The flatness of a surface plate (the deviations of its work-supporting points from a true geometrical plane) can be determined by optical or mechanical means. Studies of these several methods in combination with the work of producing, checking, and resurfacing, surface plates has enabled R. J. Rahn of the Rahn Granite Surface Plate Company to devise a method of calibrating (measuring and recording) a surface plate's out-of-planeness which is simple, accurate, and fast-working.

He has termed his method the Planekator method. It enables you to establish or locate a master geometrical reference plane which is "suspended in air" above the surface plate. From this "air born" plane we can measure differences in the vertical distances to as many points on the surface plate as are needed in order to get a picture of the plate's topography in terms of its hill-and-valley departures from a true plane surface.

Physically, the Planekator method involves a precision, calibrated (measured and recorded deviations from true straightness) straight edge, plus two support blocks for holding the straight edge up above the surface plate, and a dial indicator.

Of the two support blocks, one is fixed or solid and the other is adjustable in height. The dial indicator is incorporated in a fixture which can be slid under the straight edge. The spindle of the dial indicator projects vertically upward to make contact with the underside of the straight edge.

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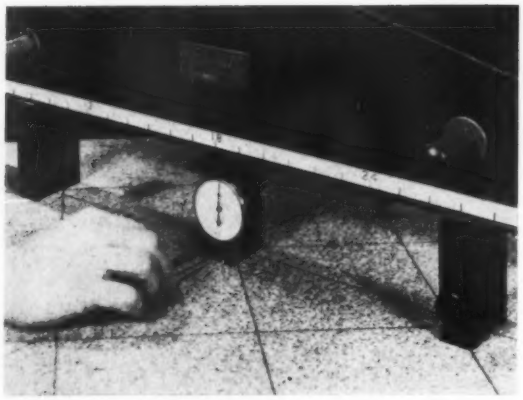

Fig. 4. Here the indicator's dial has been rotated just enough to bring the pointer and zero into coincidence. This establishes the all-important center zero (X) of the plate. When the second, or southwest/northeast, diagonal is caused to intersect the first one in a point over X, the geometrically true, "air born", reference plane is "fixed in space" for all subsequent measurements.

It, of course, does not measure the distance of the straight edge from the surface plate, just the variations in that distance that exist at various locations around-about the surface plate. Figure 1 shows the Planekator components in operating position on a granite surface plate.

The Planekator method is based on the geometrical theorem that two intersecting straight lines determine a plane. The underside of the straight edge is used to attain the two intersecting straight lines. These are above the surface plate, and the plane that they establish is a master plane to which all measurements are referenced.

The procedure starts with Figure 1. Here the camera's location is "south" of the plate, therefore the far edge of the plate is "north". The operator has positioned the Planekator to establish a northwest/southeast diagonal above the plate.

With his left hand he adjusts the height of the adjustable support (the fixed support being a fulcrum) so that he gets equal indicator readings under the northwest, Figure 2, and southeast, Figure 3, ends of the Planekator. The values of the two indicator readings are of no concern; it's just that they must be equal.

Next, the indicator is positioned in the center (X) of the plate and under the Planekator as shown in Figure 4. Regardless of what the indicator now reads, we want it to be zero, so the dial of the indicator is rotated to bring the zero to coincide with the position of the hand.

With the indicator so zeroed we go back to the northwest and southeast ends of the Planekator and note and record the values shown by the indicator. They will still be equal, but either plus, minus, or zero in relation to the center zero, depending upon whether these three points, only, on the surface of the plate (northwest — center — southeast) describe a straight line or a concave or convex arc.

Without disturbing the indicator dial's zero setting, the southwest/northeast diagonal is next established, and in the same manner. The Planekator is again adjusted so that equal readings are had under its southwest and northeast ends. These two equal readings are recorded only because they are going to be corrected.

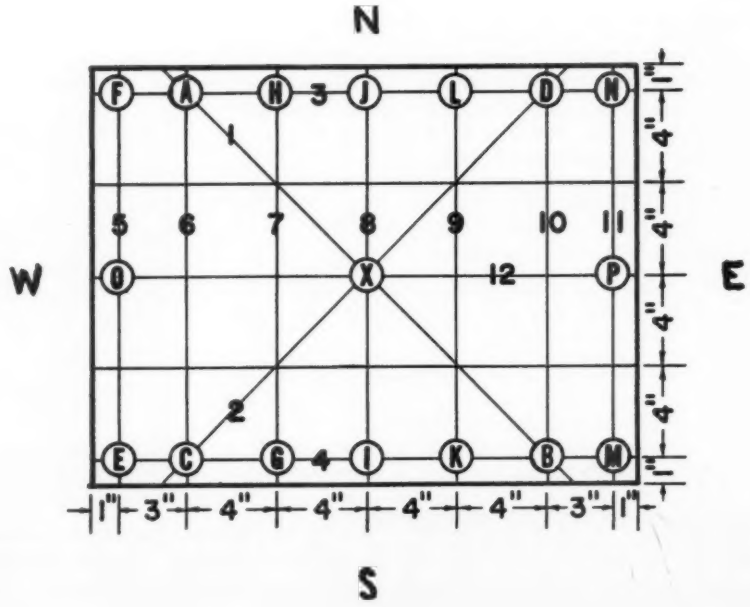

Fig. 5. The suggested procedural pattern for a 24" x 18" surface plate. This calls for eleven successive positions of the Planekator, plus the twelfth which gives the zero-zero checkout of the job's accuracy.

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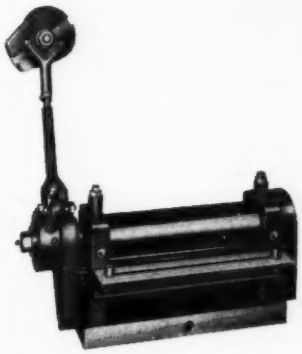

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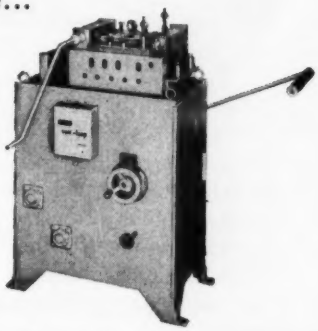

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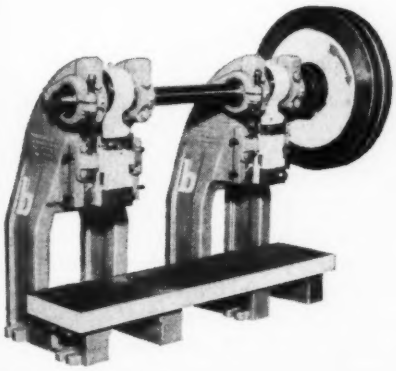

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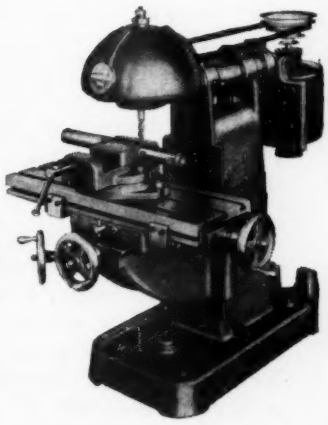

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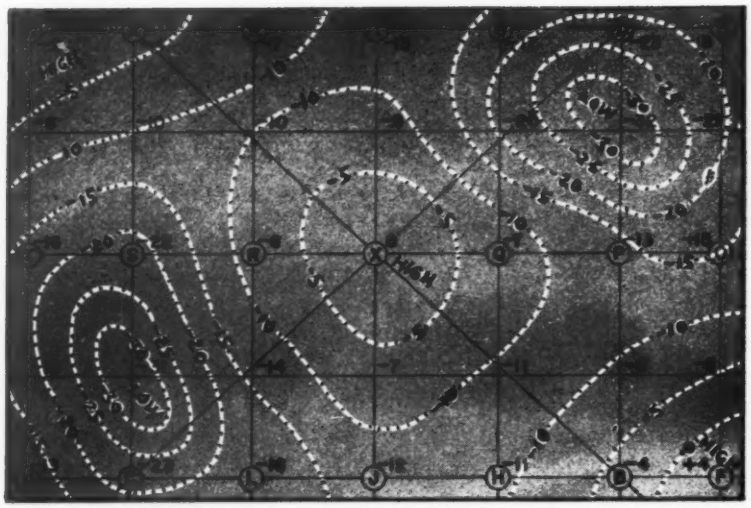

Fig. 6. On a surface plate, or on a drawing thereof, a topographic map can be drawn of the plate's overall accuracy. The dotted contour lines represent paths of equal deviation or "elevation". In this example, the map shows a "mountain top" of plus 4, and a "low valley" of minus 32. Therefore, the overall accuracy of this plate is contained between two planes which are: parallel to the "air born" true geometric reference plane, parallel to each other, and separated by 36 increments of measurement.

Again, the indicator is brought to the center (X) of the plate, Figure 4, and under the Planekator. Its reading now will be plus or minus in relation to the zeroed dial. This plus or minus value is subtracted from or added to the recorded value for the equal readings which were obtained under the southwest and northeast ends of the Planekator (our second diagonal).

If this last center (X) reading is plus on the indicator's dial, it is subtracted from the value recorded of the reading under the southwest and northeast ends of the Planekator. If it is minus, it is added to the value recorded from under the Planekator's ends.

What this last bit of arithmetic has done is this: it has (mathematically) caused the second diagonal to intersect the first one at a point over the center (X) of the plate. Therefore, these two intersecting straight lines (taken from the underside of the straight edge in its two diagonal positions) define and lie within a true geometric plane above the surface plate.

We really don't care how high this plane is or whether it is level, or parallel to the earth or the Milky Way! We do know, however, that relative to its height above the center (X) of the surface plate, the northwest and southeast corners of the plate are plus or minus a recorded value, and the southwest and northeast corners of the plate are plus or minus a recorded value. Therefore, we know how much each of the four corners deviates from our "air born" master reference plane. And, to get "down to earth" we know that each of those four corners deviates by the same value from a theoretical plane (parallel to our "air-born" plane) and which geometrically contacts the zero center (X) of the surface plate.

By using these known datum points or stations the Planekator can be so set as to enable any desired number of other points on the surface plate to be measured in terms of their plus or minus deviations from the last mentioned theoretical reference plane the center point of which geometrically coincides with, and "rests upon" the zero center (X) of the surface plate.

These procedures are best illustrated by reference to Figure 5 which suggests 11 positions of the Planekator in order to "plot" 30 points on a surface plate 18″ wide and 24″ long. Line A-B represents the northwest/southeast diagonal, and line C-D the southwest/northeast diagonal. We know, from executing the techniques of Figures 1, 2, 3, and 4 for the two diagonals, the deviations from our true reference plane of points A, D, C, and B.

Therefore the deviations from our true reference plane of the remaining points can be readily determined. (Let's remember that if we were working with a perfect surface plate all the measured points and contour lines in Figure 6 would be zero.)

To check points F, H, J, L, I, G, and N, along the north boundary F-N of Figure 5, we support the Planekator above this line. We know the deviation at A from our true reference plane, and likewise at D. If we could only work from a geometric line extending from A to D we could easily measure the intervening hills and valleys; but we can't, just because of those hills and valleys. We lick that by putting the Planekator up in the air so it is parallel to the imagined geometric line A-D by the following procedure.

We know, by reference to Figure 6 (which, by the way, simply represents this calibrating

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CIRCLE INFORM-A-GRAM KEY NO. 75

procedure on a surface plate of different size and rectangular proportion than that of Figure 5) that point A deviates from our true reference plane by minus 4 (half-thousandths, tenths, or half-tenths, however close we can read the dial indicator). And we know that point D deviates from our true reference plane by minus 23. In other words, from A to D there is a gradient (degree of slope) of 19. This means that the geometrical line from A to D is at an angle to our true reference plane.

We position the Planekator to that same gradient by manipulating the adjustable support (Figures 1 and 3) so that the indicator readings at A and D differ by 19. Then we rotate the dial of the indicator so that at A the hand of the indicator reads minus 4 and, obviously, at D the indicator hand will read minus 23, as shown in the example of Figure 6.

This establishes that the Planekator is parallel to the geometric line A-D of Figure 5 (the same as A-D of Figure 6). This means that the other points along A-D (a line passing through the hills and valleys of the surface plate) can now be measured as at F, H, J, L, and N (Figure 5) in terms of their respective deviations from our true reference plane simply by passing the indicator under the Planekator at those locations.

These are absolute readings involving no calculations or corrections because, remember, the indicator's dial was rotated or "oriented" to the gradient of 19 which exists between the two known points (A and D of Figure 6) of minus 4 and minus 23.

For all remaining positions of the Planekator it is always set to the gradient prevailing between two known values (or "elevations"). In this manner deviations are measured along the lines, Figure 6, of N-F (south boundary), E-F, D-B, G-H, I-J, K-L, A-C, and M-N. Note that as the calibrating job progresses we always find two known-value points awaiting us with which to establish the proper gradient for the Planekator.

From all the recordings made in calibrating a surface plate, a topographical map showing contour lines can be made, such as that of Figure 6, if desired.

The Planekator method proves out when we set the Planekator to the gradient (one unit difference) existing between the ends of the line T-O, Figure 6, i.e., minus 16 and minus 15 respectively. As the indicator is stepped along line T-O via S, R, X, A, and P, it goes "up hill" from T (minus 16) to center zero (X) and then "down hill" to minus 15 at O.

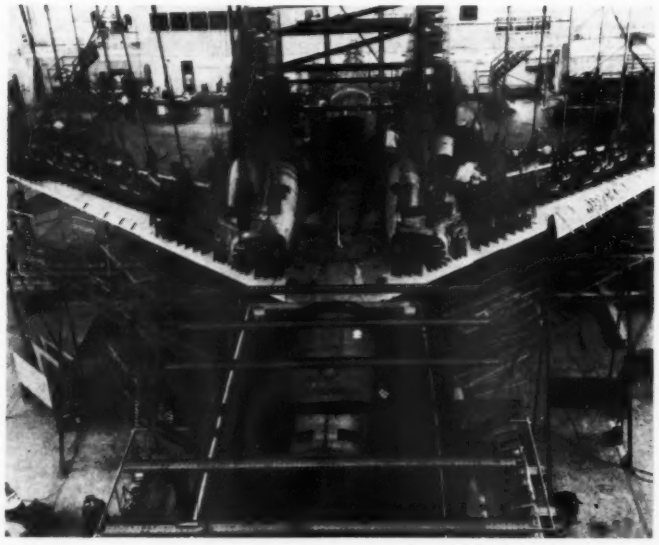
Inasmuch as we experienced the same kind of a "ride" in going from I on the north border to J on the south border, meeting up with center zero (X) at O, we're right back to our original geometry theorem, i.e., two intersecting straight lines determine a plane.

That is the plane, common to X, to which all the surface plate's hills and valleys have been referenced. And that is how flat your surface plate is. You know because you measured it.

In conclusion, it takes a lot longer to describe, or read about, the Planekator method than it does to use it in your shop! **end**

QUALITY CONTROL -- KING SIZE

While its nose is dunked in a tank for airframe tests of cabin pressurization, the wings of this Martin P6M Seamaster are being subjected to structural forces ranging from 300 to more than 450 tons, to prove out the integrity of the airframe against the aero-dynamic forces encountered in high speed flight — 600 mph from four jet engines.



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An aviation manufacturer recently faced a problem similar to those faced by many missile-makers — drilling a ¾" dia hole through a one-inch thick, super alloy forging designed for Mach IV speeds. Rockwell hardness was 56-58C; tensile strength, 310,000 psi.

The production department had been using electrical discharge to drill the metal, but it took too long — 105 min. Upon request, a Drillmation representative recommended a standard model 800 heavy duty drilling unit using a standard carbide drill with ordinary soluble oil as a coolant. After a few hours to find the proper speed and feed combination adjustments, the unit was set up to drill the hole automatically in only 80 sec — a time reduction of more than 98%!

These Drillmation units were developed to meet the need for drilling new alloys for use in missiles — tough alloys having great resistance to heat, strains, and friction.

One requirement for drilling tough metals is an extremely low rate of feed per revolution. This rate may start at 0.0002" and rate of feed must be constant because of the air hardenable properties of many materials. Once determined, it must not vary by as little as 0.001"/inch of feed length. Constancy of feed is important. If the drill dwells, the heat generated will harden the work, and the drill will burnish and dull its own edge, making further drilling impossible.

Rate of feed must be adjustable with precision as the work permits. For example, starting at 0.0002 ipr, it may be adjusted by intervals up to 0.0008 ipr.

Rpm's of the drill spindle must also be accurately changed as the project requires. Spindle, bearings and the complete drilling unit must be completely vibrationless.

Variable feeds utilizing hydraulic power must not permit heat rise of the hydraulic fluid due to constriction at any point. Such heat rise will produce erratic feeds, as will any air or foreign bodies trapped in the fluid.

Drillmation units solve these problems through the use of a positive feed piston-type pump to administer hydraulic pressure directly, in a straight line, to the drill spindle. This patented feature permits adjustments of pressures up to 5,000 lbs.

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For more information on this unit, write to Drillmation Company, 6500 E. 11 Mile Rd., Center Line, Mich., or—**Circle Inform-A-Gram No. D1.**

NO CALCULATIONS

Anyone who can read an indicator can calibrate a surface plate in minutes with the Planekator!

In effect, the instrument locates a perfect reference plane over the surface plate. All you need to do is to take indicator readings between the reference plane and the surface plate. Record the readings on a chart. It's as simple as that . . . not a single calculation is required!

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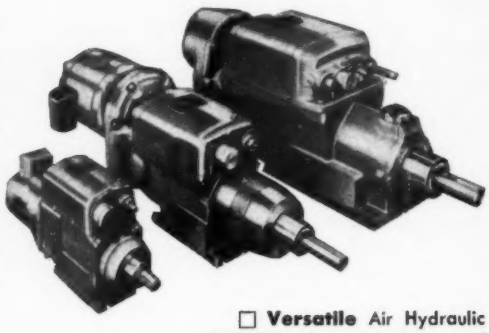

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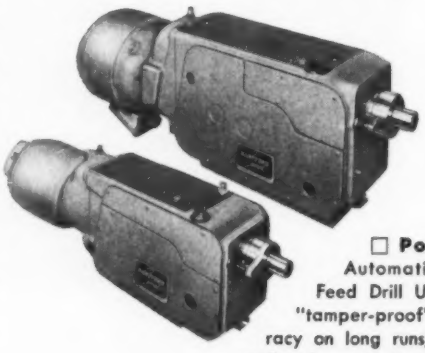

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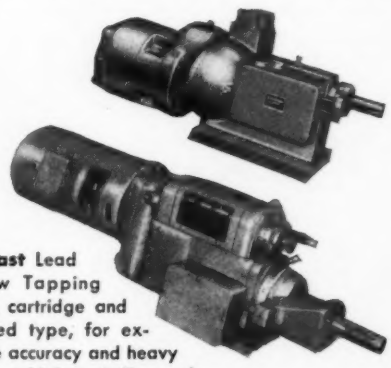

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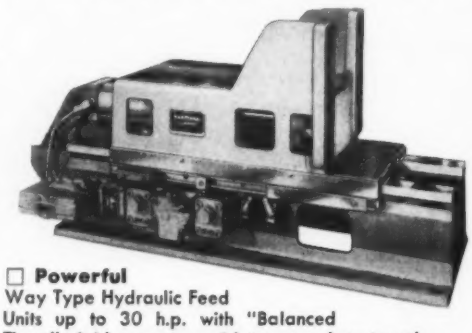

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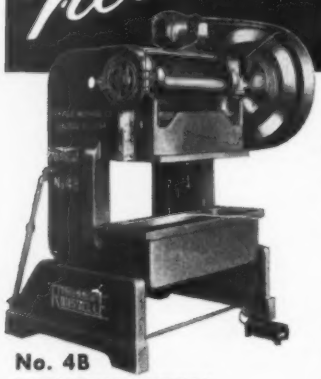

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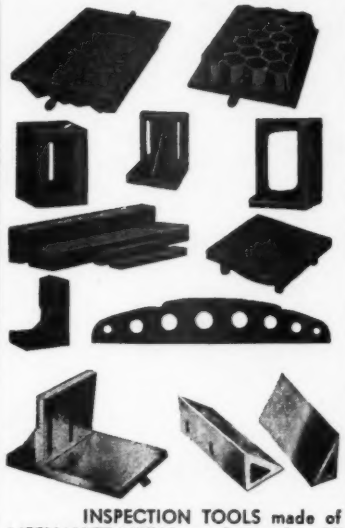

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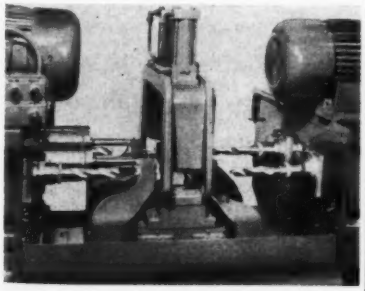
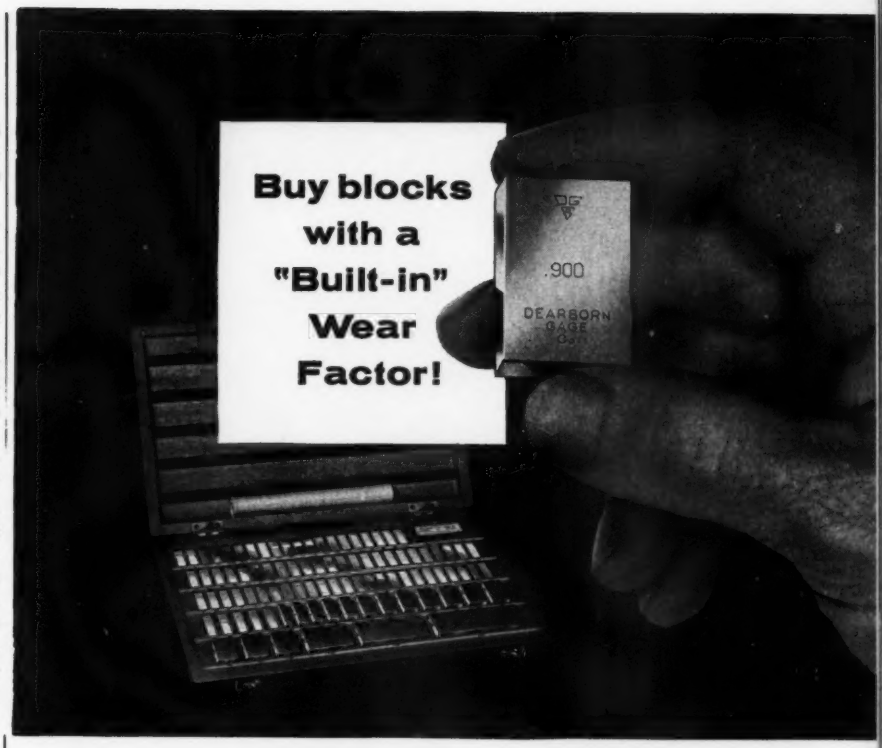


Closeup of Style 17-A machine showing pair of special 1.116" dia drills at right and the pair of 1.428" dia drills at left, together with boring bars that perform the step boring. In the center is the indexing fixture.

. . . Continued on page 83



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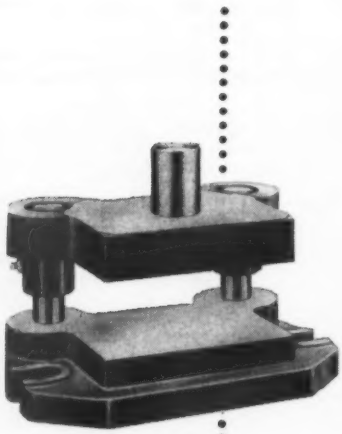

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. . . Boring Machine from page 81

loaded side by side in a fixture and clamped down hydraulically.

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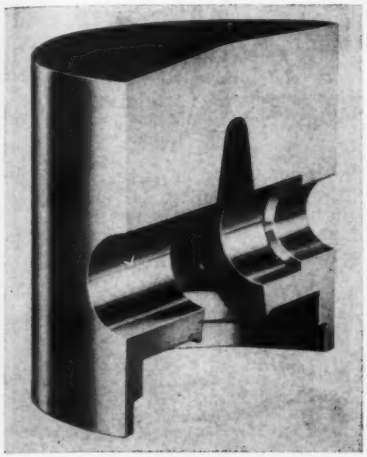

Sectioned view of 6½" dia aluminum alloy aircraft piston showing the stepped, semi-finished wrist pin hole, bored from the solid.

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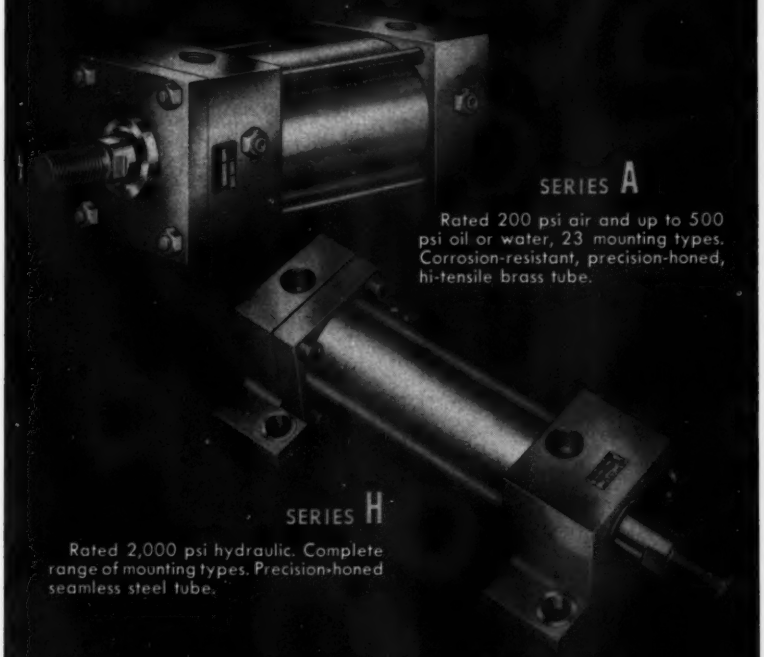

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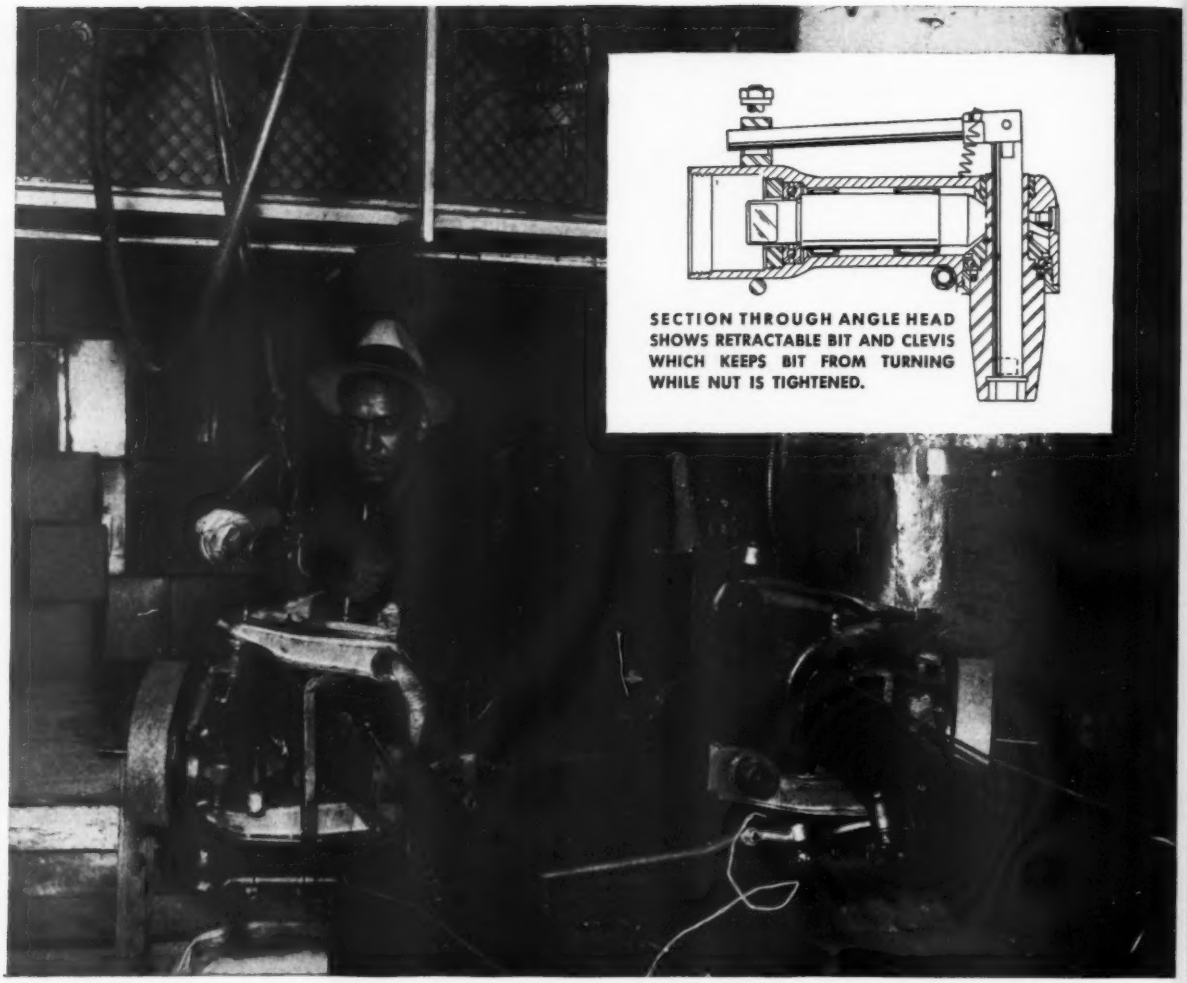

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High Speed Steel Tool Bits are made of selected steels, have accurate shapes, and have controlled heat treatment. Three grades are available for general purpose cutting, production tooling, and high speed steel tooling. Specifications are given in Circular 613, available from Pratt & Whitney Co., Inc., Charter Oak Blvd., W. Hartford 1, or — **Circle Inform-A-Gram No. B1.**

The Vertiform 4-Slide Machine for automatic wire and ribbon stock forming, is described in a catalog which contains a complete specification table on the machine, and points out advantages of this type of equipment. Also covered are specific machine design features and standard equipment. Request copies of Catalog V-187 from The A. N. Nilson Machine Co., Shelton, Conn., or — **Circle Inform-A-Gram No. B2.**

A Miniature Ball Bearings Line, ranging in size from ⅜" OD to 1/10" OD, is described in a bulletin. Information on standard radial miniature bearings including bore dimension charts on all radial types such as radial retainer, and flanged radial retainer are given. Ask for the 1958 miniature ball bearings catalog from Miniature Precision Bearings, Inc., Precision Park, Keene, N. H., or — **Circle Inform-A-Gram No. B3.**

How to Select the Most Efficient Electrode for a particular welding job is the topic of a Weldirectory published by The Lincoln Electric Co., Cleveland 17. Discussions include the basic characteristics of each family of electrodes which cover the physical properties, current ranges, sizes, and welding procedures for each electrode. Get your copy of Catalog 7000.1 from the company, or **Circle Inform-A-Gram No. B4.**

Toolroom Grinding Wheels are covered in a brochure which gives features and applications of these wheels for both general toolroom and cutter and tool grinding. It also contains a complete table of starting grades for a wide range of toolroom grinding operations. Get your copy of Brochure PG-350 by writing Cincinnati Milling Products Div'n, Cincinnati Milling Machine Co., Cincinnati 9, or — **Circle Inform-A-Gram No. B5**

"Tool Room Grinding with Robertson Wheels" contains tables of wheel types, sizes, and markings applicable for high speed steel cutter and drill sharpening, vertical spindle, rotary table, and reciprocating table surface grinding. Obtain your copy of this bulletin from Robertson Mfg. Co., Dept. 76, P. O. Box 848, Trenton 5, N. J., or — **Circle No. B6.**

A 42-Page Fastener Catalog features detailed specifications, engineering drawings, applications, and installation information. Data on the new Hing-Lock and Spring-Loaded Link-Lock is given, as well as details on other special fasteners. Get your copy of Catalog 1257 from Simmons Fastener Corp., N. Broadway, Albany 1, N. Y., or — **No. B7.**

ACCURACY at a PRICE

(YOU CAN'T AFFORD TO BE WITHOUT) **(YOU CAN AFFORD)**

NICHOLS

STANDARD Model — A precise, versatile hand miller with Rise and Fall Spindle. Base price $2375.00.

SEMI-AUTOMATIC Model 8SA for fast high production to TENTHS. Base Price $3600.00.

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CIRCLE INFORM-A-GRAM KEY NO. 85

The new Vertical Illuminator and the AO Spencer Cycloptic Stereoscopic Microscope make a unique team that can be the answer to your problem whether it's the inspection of detail in small diameter, deep hole borings, or delicate assembly of miniaturized parts where every move is critical.

This low-cost illuminator readily attaches to the Cycloptic to provide efficient, shadowless illumination deep inside small orifices...and the Cycloptic delivers realistic, erect, true three-dimensional magnification of the illuminated detail.

The remarkable long working distance afforded by Cycloptic (up to 7 inches when Vertical Illuminator is used with 53 and 59 Series) gives you *plus* advantages... permits ample room for large size objects or inspection and assembly tools.

Add this unit to your present Cycloptic or ask about low-cost Vertical Illuminator and Cycloptic stereoscopic microscope combinations.

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INSTRUMENT DIVISION, BUFFALO 15, NEW YORK

Dept. E179
Please send me FULL INFORMATION on the NEW AO SPENCER VERTICAL ILLUMINATOR AND CYCLOPTIC MICROSCOPES.
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ADDRESS_____
CITY_____ ZONE____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 86

"Revitalizing Older Presses Through Press Rebuilding" describes special facilities and techniques used in rebuilding older presses. The bulletin shows a rebuilding process

step-by-step. Obtain a copy of Bulletin 47 from E. W. Bliss Co., 1475 Raff Rd., S.W., Canton, Ohio, or — **Circle Inform-A-Gram No. B8.**

Two-Point, Straight-Side, Double-Geared Presses, with capacities ranging from 150 to 5000 tons, are discussed in a bulletin. A feature of the MS2 machine is the intermediate shaft combination air-friction clutch and brake drive arrangement which allows the press to deliver high single stroke efficiency. The Minster Machine Co., Minster, O., will supply copies of the bulletin. **Circle No. B9.**

Machine Tool Attachments are presented in a bulletin which describes and gives a list of specifications for each item. Information on bed turrets, cross slides and bar feeds, hand lever collet closers, and chucks are included. Request a copy of this bulletin from Precision Processing Co., Los Angeles 39, or — **Circle Inform-A-Gram No. B10.**

Standard Hydraulic Pull Tools for fastener installation are highlighted in a bulletin which lists hydraulic pull tool nomenclature. Each of the three basic hydraulic units available and the unit's operating characteristics are discussed. Contact Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, for copies of Catalog 8-420, or — **Circle Inform-A-Gram No. B11.**

Special Taps, Dies, and Thread Gages are listed in a bulletin or wall chart, "Don't Wait Four Weeks." Listed are special and standard taps and dies, thread and plain plug gages, and ring gages. Field Tool Supply Co., 29 S. Desplaines St., Chicago 6, will supply copies, or — **Circle Inform-A-Gram No. B12.**

NEW! 24-PAGE CATALOG ON WATERBURY FARREL SLITTERS

Get your free copy...

THE WATERBURY FARREL FOUNDRY & MACHINE CO.
Waterbury, Conn.

Gentlemen:
Please send me my free copy of your Slitting Equipment Catalog, Circular No. 898-S-2

Name _____ Title _____
Company _____
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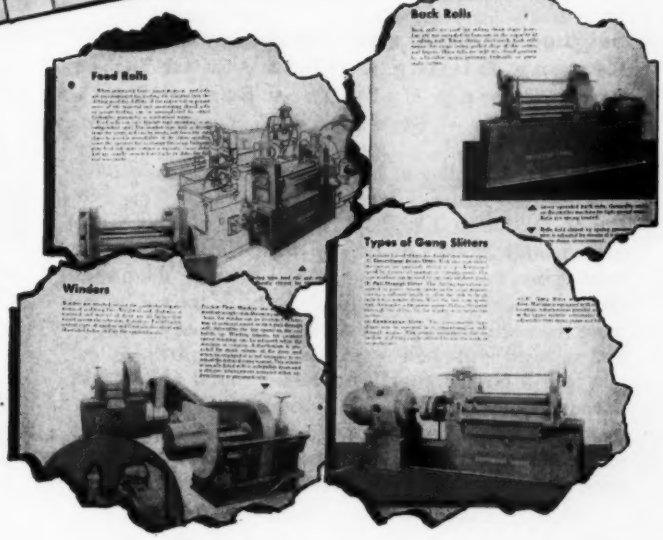
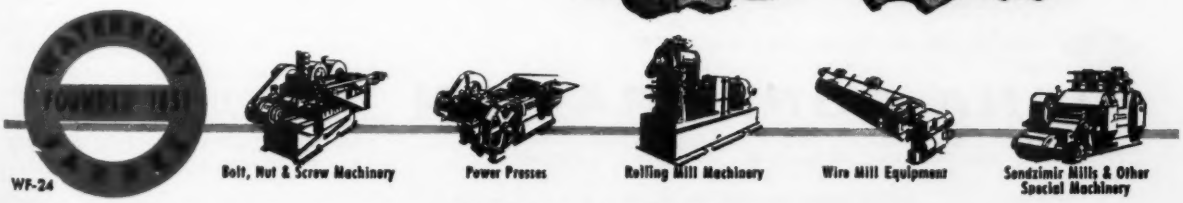
Send this coupon today



Covers extensive line of WF slitting equipment for warehouse and factory use. Sizes range from small hand-operated slitters with 3" diameter cutters to fully automatic slitting lines with 16" diameter cutters.

Gives details on various slitter types as well as payoffs and coil boxes, loaders, straighteners, feed rolls, back rolls, cutters and spacers, stripper fingers, winders and coilers. Includes specifications and cutting capacity chart. Send for your copy.

THE WATERBURY FARREL FOUNDRY & MACHINE CO.
Waterbury, Conn.
Branch offices: Chicago, Cleveland, Millburn, N. J.



WF-24

CIRCLE INFORM-A-GRAM KEY NO. 87

new, revolutionary

ALINA SELECT-O-POINT

drill grinders

Right hand twist drill, with centre

Twist drill for soft material, lips corrected

Three-flute drill core drill

Spot facing cutter, countersink angle 60°

Screw tap, grinding of the angle of rake

Designed for rapid and accurate grinding of:
Keyway Milling Cutters • End Mills
Spot Facing Cutters • Screw Taps
Twist Drills • Step Drills • Reamers, etc.

Three models to choose from — *No. 01-2 Range .004" thru .080"—No. 03-6 Range .012" thru .240"—No. 2-32 Range .093" thru 1.250".* Each machine is a complete system built around a *planned drill point.* Applied to twist drills, this new drill point will increase the useful life of your drills — reduce the drill thrust force — eliminate the need for center punching — produce a rounder and more accurate hole — and on the larger drills afford you a drill point that will produce a round and almost burr-free hole in sheet metal. Fully variable adjustments may be accomplished with a minimum of effort; settings once selected may be altered or repeated *exactly* at any time. Accuracy and simplicity is built into each machine.

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CIRCLE INFORM A-GJAM KEY NO. 88

Expanding Collets for Precision Internal Chucking are said to complete many important machining operations in one chucking. Full

information and application suggestions are given in Bulletin EC available from Hardinge Brothers, Inc., Elmira, N. Y., or — **Circle No. B13.**

Shop-Blocks, accurate to within +0.000006" or −0.000002" of nominal sizes, are described in a catalog sheet. They can be used as working gages, which eliminates costly errors due to inaccurate instruments or resulting from transfer of measurements. Direct requests for copies of Catalog Sheet 57-1 to The DoAll Co., Des Plaines, Ill., or — **No. B14.**

"Carbide Tools" tells how to select the proper carbide tool for the job and also shows detailed applications as well as actual photos with dimensions of each tool. Standard carbide blanks, lapped toss-away inserts, and toolholders are among the items included. Catalog 857 is available from Besly-Welles Corp., S. Beloit, Ill., or — **Circle No. B15.**

Easily Select High Speed Tools and Carbide Tools from a new catalog published by Severance Tool Industries, Inc., 3765 Olive, Saginaw, Mich. Mills, reamers, countersinks, drills, and special cutters are listed in a graphic index which pictures the item and gives page numbers. Get your copy of Catalog 23 from the company, or — **Circle No. B16.**

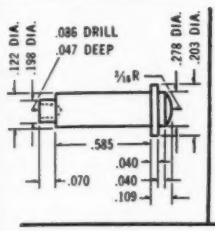
Select Precision Expanding Mandrels from a new folder that gives a description of each type of mandrel, straight jaw, step jaw, and miniature, along with the range of available sizes. Also included is a section on special mandrels for specific applications. Get Bulletin LC1257 from LeCount Tool Works Inc., 38 Cody St., W. Hartford, Conn., or — **B17.**

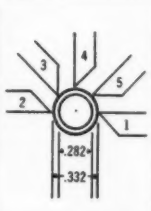
BETTER MACHINING STARTS WITH ALCOA SCREW MACHINE STOCK

One part held up production!

KEYSTONE CAMERA SWITCHED TO ALCOA ALUMINUM

CUT 1-MINUTE MACHINING TIME TO TEN SECONDS . . .





CAM RATIOS

Head Stock	1:1
Rocker	1:3
No. 3	1:2
No. 4	1:2
No. 5	1:
Attachment	1:1

Spindle speed 6000 R.P.M.
Threading speed R.P.M.
Surface speed 400 F.P.M.
Production pieces per min. 12.4
4.85 sec. per piece

NO.	OPERATIONS	TRAVEL OF TOOL	RATIO TO 1	CAM CHANGE	FEED UNIT = .001	REVOLUTIONS	PRODUCTIVE DEGREES	UNPRODUCTIVE DEGREES	PROGRESSION
1	Return #3							8	8
2	Spot center	.066	1	.066	3	22	16		24
	Safety							2	26
3	Return center							—	—
	Advance #1 to .122 dia. (on stop)	.115	3	.345				12	38
	Safety							2	40
4	Turn .122 dia. #1 (on stop)	.090	1	.090	3	30	22		62
	Safety							2	64
5	Return #1 to .198 dia.	.048	3	.144				8	72
	Safety							2	74
6	Turn .198 dia. #1	.585	1	.585	4	147	109		183
	Safety							2	185
7	Return #1 to .278 dia.	.040	3	.120				7	192
	Safety							2	194
8	Turn .278 dia. #1	.100	1	.100	4	25	19		213
	Safety							2	215
9	Return #1—Advance #2	.042	3	.126				(8)	—
	Drill .086 dia.	.070	1	.070	3	24	18		233
	Safety							2	235
10	Return drill							—	—
	Form in #2 to .203 dia.	.050	3	.150	2.5	20	15		250
	Safety							2	252
11	Turn .203 dia. #2	.069	1	.069	4	18	14		266
	Safety							2	268
12	Return #2	.065	3	.195				7	275
13	Cut off and form radius #3	.142	2	.284	2.5	57	42		317
	Open collet							10	327
14	Return headstock	.844	1	.844				18	345
	Close collet							15	360
						343	255	105	
									235
10	Chamfer #4	.025	2	.050	2.5	10	8		243
	Safety							2	245
	Return #4							5	250

This part in stainless steel (type 2416) was holding up production of Keystone Camera's 8-mm Capri line. Keystone production men switched to ALCOA® Aluminum Screw Machine Stock (Alloy 2011-T3) and cut machining time 83 per cent—from one minute to *ten seconds.*

That's a 6-to-1 advantage—typical with free-machining aluminum. Notice the tool layout—aluminum permits higher speeds (even 1,000 fpm is common), increasingly important with today's complicated screw machine part designs.

Since the change to lightweight aluminum, Keystone reports less tool maintenance, easier handling, better finishes. Aluminum retains the surface finishes produced by machining. You can polish, buff, brush or burnish it.

Find out more about performance in screw machines. Here's how to do it:

- Meet Tom Conroy, Alcoa's screw machine specialist and field consultant. He will be glad to demonstrate aluminum's advantages. See coupon.
- Send for free book, *Alcoa Aluminum in Automatic Screw Machines.* It's a valuable procedures manual written for production men.
- Ask for immediate stock delivery by calling your nearest Alcoa sales office or Alcoa distributor.

"ALCOA THEATRE" Exciting Adventure Alternate Monday Evenings

ALCOA ALUMINUM

Look for this label... it's your guide to the best in aluminum value

Aluminum Company of America
876-E Alcoa Building, Pittsburgh 19, Pa.

Yes, I'd like to—
☐ hear from Tom Conroy.
☐ have a copy of *Alcoa Aluminum in Automatic Screw Machines.*

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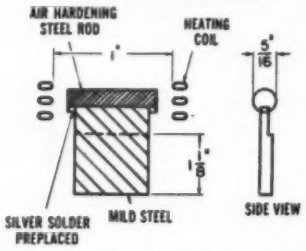
The Lepel Line of induction heating equipment represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating.

If you are interested in induction heating you are invited to send samples of the work with specifications. Our engineers will process and return the completed job with full data and recommendations without any cost or obligations.

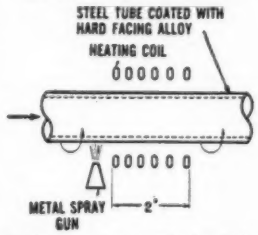
TYPICAL INDUCTION HEATING APPLICATIONS

SIMULTANEOUS HARDENING and BRAZING

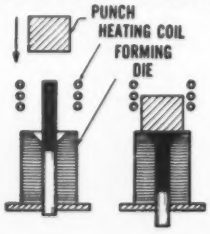


The machined and finished rod of air-hardening steel is simultaneously hardened and brazed to a mild-steel tab. Use of a purified hydrogen atmosphere and a high temperature brazing alloy permits successful hardening of alloy steels without discoloration and scaling even in the absence of flux.

DIFFUSION BONDING OF SPRAYED METAL COATINGS



Corrosion or wear resistant metal coatings sprayed on metal surfaces can be improved by heating to achieve alloying by diffusion. The drawing shows a typical arrangement for processing steel tube sprayed with hard facing alloy. Long tubes may be progressively sprayed and heated.



HEATING HIGH STRENGTH ALLOYS FOR FORMING

Uniform and rapid heating of high strength alloys (alloy steels, titanium, etc.) aids in upsetting and forming operations and also minimizes oxidation and embrittlement.

Electronic Tube Generators from 1 kw to 100 kw.
Spark Gap Converters from 2 kw to 30 kw.

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All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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CIRCLE INFORM-A-GRAM KEY NO. 90

Fasteners are easily selected from a catalog from the Grip Nut Co., S. Whitley, Ind. Advantages and dimensions are given for lock nuts,

centerlock nuts, weld nuts (pilot type), and countersunk weld nuts. Included is a list of typical applications of these fasteners. Write to the company for a copy of this bulletin, or — **Circle No. B18.**

Blast Cleaning, Finishing, and Shot Peening Ideas utilizing the airless abrasive blast method are discussed in a 28-page handbook. Applications include cleaning of castings, forgings, and heat treated parts; deflashing of plastic moldings; reconditioning of brake shoes, and gas cylinders; and descaling of steel mill products such as sheet, strip, and wire rod. Catalog 143-D is available from Wheelabrator Corp., 1821 S. Byrikit St., Mishawaka, Ind., or — **No. B19.**

"Reference Book and Guide on Zamak Zinc Base Alloys" is now being offered to die casters and engineers by Henning Brothers & Smith Inc., 91-127 Scott Ave. at Randolph St., Brooklyn, N. Y. The booklet gives specifications, advantages, and uses of these various alloys in sand castings, stamping dies, slush and permanent mold castings. Write to the company for a copy of this booklet, or — **Circle No. B20.**

"How to Determine if a Lathe will be a Money-Maker" is a booklet which presents a check list of minimum requirements in design and construction features to obtain low-cost operation and maintenance. This list applies particularly to the light-duty engine and toolroom class lathes. Address Cincinnati Lathe and Tool Co., 3207 Disney St., Cincinnati 9, for copies of this bulletin, or—**Circle Inform-A-Gram No. B21.**

NOW... THE ONLY COMPLETE LINE OF GUN DRILLING TOOLS

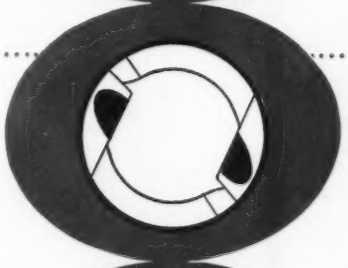
Enables you to specify an application-engineered carbide gun drill or gun reamer to suit your particular production, material and finish requirement. Every tool in the precision Star line has been wear-life proven in quantity runs on production parts in both the Star Cutter gun drill development laboratory and metal-working plants.

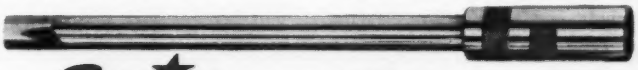
® Starbore DRILL

Has the exclusive trepanning action. Produces precision through-holes from the solid in cast iron, bronze, aluminum and some stainless steel parts. Two-flute carbide design.

Starbore CENTER-CUT DRILL

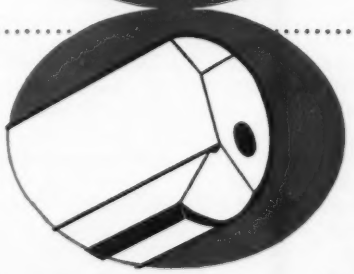
Produces no pin. For precision blind holes, holes that intersect cross holes, and applications where a pin is not desirable. Two-flute carbide design.





Starbore REAMER

A gun reamer that provides the ultimate in finish and wear life. For enlarging previously drilled or cored holes to finish size in one operation. Two-flute carbide design.

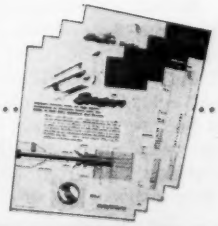


Star GUN DRILL

A gun drill of conventional design for drilling precision holes from the solid in steel. Made in sizes from 3/16-in. to 1½-in. diameter. Single flute carbide design.

Starbore Gun Drilling Services . . . Automated setups for large production runs. Quick-change fixtures for job-lot work. Send blueprints for prompt quotations.

Write for this catalog file giving complete information on Starbore gun drilling tools.



Star Cutter Company

Originators of Accurate Ground-Form Tools

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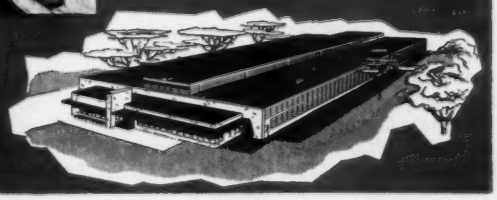
Telephone: (Detroit) KEnwood 3-4500



CIRCLE INFORM-A-GRAM KEY NO. 91

A New Drill Press Vise and the improvements in Wilton's MilOmatic air-hydraulic vise are described in a catalog. The MilOmatics, used as automatic production fixtures, provide instant, automatic clamping

NEW...
push-pull rapid action!
WILTON DRILL PRESS VISES
combine free sliding action with positive screw action . . . automatically!
WILTON

action and can be moved from machine to machine. Catalog 691 is available from Wilton Tool Mfg. Co., Inc., Schiller Park, Ill., or — **No. B22.**

A Dial Comparator Set can be used for three applications — as a dial indicator, as a bore gage, and as a dial test indicator. A bulletin gives specific information on the uses of this set. For your copy of Catalog D, write to Alina Corp., 122 E. 2nd St., Mineola, L. I., N. Y. **No. B23.**

Chip Breaker and Cup Wheel Grinders are among the line of electrolytic carbide tool grinders described in a bulletin. Vises and grinding fixtures for a fast regrinding of throwaways and inserts, and advantages of the electrolytic grinding are also included. Write to Hammond Machinery Builders, Inc., Kalamazoo, Mich., for a copy of Catalog 255. **Circle No. B24.**

Grinding Consistently to Extremely Close Tolerances when required is one of the advantages of the Landis 10" Type H precision universal cylindrical grinder described in a bulletin. Features and operations are explained and pictured. Get Catalog 1-57 from Landis Tool Co., Waynesboro, Pa., or—**Circle No. B25.**

Milling, Grinding, and Screw Machines and the various optical mechanisms and additional equipment is discussed in a catalog. Advantages and complete specifications are given for each machine. Contact Brown & Sharpe Mfg. Co., Providence, for a copy of Catalog MT2, or — **No. B26.**

How Diamonite High Alumina Ceramic Custom Shapes are made available for induction heating, welding, and brazing use as insulators, locators, guides, and supports is explained in a bulletin. Physical properties and characteristics of Diamonite are listed. Request copies of Bulletin WF-1157 from Diamonite Products Mfg. Co., 1232 Cleveland Ave., N.W., Canton 3, Ohio, or — **Circle Inform-A-Gram No. B27.**

Heavy-Duty Geared Head Lathes available in standard sizes from 48" to 144" are described in a 32-page catalog. Detailed descriptions of construction, design, and operating features of the complete line are given. For Catalog 1216 write Consolidated Machine Tool Div'n, Farrel-Birmingham Co., Inc., 565 Blossom Rd., Rochester 10, N. Y., or — **Circle Inform-A-Gram No. B28.**

"Accessories for Lathes and Milling Machines" lists 325 standard replacement tools including precision live centers, chucks, arbors, adapters, and precision boring heads. Illustrations accompany the description of specifications. Ask for Catalog GN-2 from Montgomery & Co., Inc., 9 Tichenor Lane, Newark 2, N. J., or **Circle Inform-A-Gram No. B29.**

Conveyor Chain provides the shock- and wear-resistance and high strength-to-weight ratio for trouble-free operations of apron or slat conveyors, roller flight conveyors, etc. Construction features and possible chain combinations are listed in the bulletin from The Alvey-Ferguson Co., 2391 Disney St., Cincinnati 9, or **Circle Inform-A-Gram No. B30.**

Flat Surface Disc Grinders and Abrasive Discs are among the machines pictured and described in a bulletin. The economies of double disc grinding and the types of materials and workpieces that can be accommodated are also given. Bulletin CG-58 is available from Gardner Machine Co., Dept. 21, Beloit, Wis., or— **Circle Inform-A-Gram No. B31.**

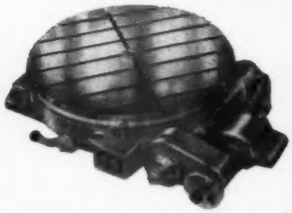
The QAF Quick-Action Stressed Panel Fastener is discussed in a bulletin which gives complete engineering specifications and qualification test data. These fasteners are designed for use on structural load-carrying panels in aircraft or where quick access to service areas is required. The bulletin is compiled by Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y., or — **Circle Inform-A-Gram No. B32.**

Check this Complete Line of

PRATT & WHITNEY

Precision

ROTARY TABLES



HORIZONTAL ROTARY TABLES

- 12-Inch Hand Operated
- 20-Inch Hand Operated
- 24-Inch Motor-Driven
- 30-Inch Motor-Driven
- 42-Inch Motor-Driven
- 50-Inch Motor-Driven

OPTICAL ROTARY TABLE

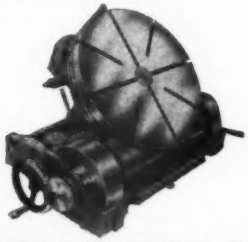
- 24-Inch Horizontal

AUTOMATIC INDEXING

- 42-Inch Horizontal

NUMERICALLY CONTROLLED

- 42-Inch Horizontal



TILTING ROTARY TABLES

- 10-Inch Hand Operated
- 16-Inch Hand Operated
- 24-Inch Power Rotated
- 36-Inch Power Rotated

VERTICAL ROTARY TABLES

- 30-Inch Motor-Driven
- 48-Inch Motor-Driven

NUMERICALLY CONTROLLED

- 30-Inch Vertical

PRATT & WHITNEY

PRATT & WHITNEY COMPANY, INC.
Charter Oak Blvd., West Hartford, Conn.

Please send my free copy of your Circular No. 619, describing all 16 sizes and models in the Pratt & Whitney line of Precision Rotary Tables.

NAME _____

POSITION _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE _____ STATE _____

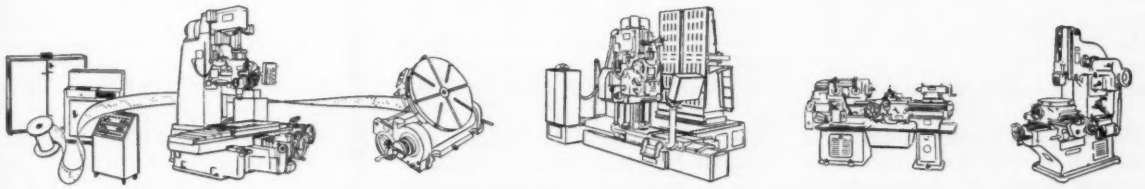
16* PRECISION ROTARY TABLES To Choose From!

Whatever your requirements on jobs involving accurate circular spacing or angular positioning, you'll find the *right* rotary table in our complete line. All of the 16 available sizes and models are accurate to a few seconds of arc . . . and if you require the ultimate in precision, the P&W Optical Rotary Table has a guaranteed overall accuracy of *3 seconds of arc*. This is *real accuracy* when you realize there are 1,296,000 seconds in a complete circle!

P&W Rotary Tables are built for ruggedness and stamina as well as precision. Whether you use them in conjunction with jig borers and other tools to save time and set-up in machining operations . . . or by themselves for faster, more accurate inspection, circular graduating or layout . . . P&W Rotary Tables will take continuous, heavy-duty work in stride.

Get all the facts on the 16 sizes and models of Pratt & Whitney *Precision* Rotary Tables now. See how one of these tables can bring new speed, accuracy and economy to your operations. Use the coupon above to send for your copy of our new circular, which tells you all about these precision rotary tables.

Pratt & Whitney Company, Inc.,
10 Charter Oak Blvd., West Hartford, Conn.

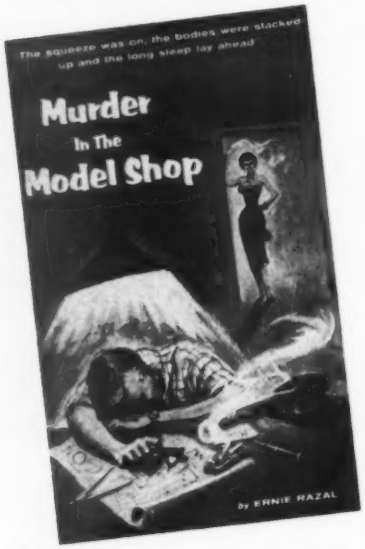


NUMERICAL CONTROL . . . JIG BORERS . . ROTARY TABLES . KELLER MACHINES . LATHES . . VERTICAL SHAPERS

PRATT & WHITNEY
FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 93

"Murder In The Model Shop" tells the story of the problems a company has before they discover Servo-board electro-mechanical assembly kits. If you are having trouble assembling, testing, correcting, and proving any



design that calls for a combination of electrical and mechanical components, read this tale and learn the advantages of these kits. For your copy, write to Servo Corporation of America, 20-20 Jericho Twp., New Hyde Park, L. I., N. Y., or — **No. B33.**

Small-Diameter Super-Alloy Tubing for applications requiring strength at high temperatures is described in a bulletin. Given are chemical composition, physical and mechanical properties, and production limits for the 16 super-alloys in the line. Request copies of Bulletin 70 from Superior Tube Co., 1733 Germantown Ave., Norristown, Pa., or—**Circle Inform-A-Gram No. B34.**

Blank Heavy Material up to ½" thick (or more) with the 400-ton capacity 40E-9 heavy material blanking press offered in a bulletin. Construction features, which give the press its rigidity and tremendous power for this heavy blanking, are shown in diagrams. Obtain this bulletin, Section 12, from The Minster Machine Co., Minster, Ohio, or — **Circle Inform-A-Gram No. B35.**

Finishing Equipment is outlined in a bulletin which gives information on three types of equipment — cleaning, painting, and baking. Isometric drawings of the different types of equipment are given. Catalog 600 is released by Schmieg Industries, Inc., P. O. Box 4701, Detroit, or—**Circle Inform-A-Gram No. B36.**

Cylindrical Pin and Thread Plug Gages, plain and thread ring gages, and a line of gage setting plugs, snap gages, master setting disks and gage blanks are presented in a bulletin. Specifications are given for all types. Write to Marcellus Mfg. Co., P. O. Box 2, Belvidere, Ill., for a copy of this precision gage catalog, or — **Circle Inform-A-Gram No. B37.**

Inspection or Measuring Problems can be handled by various Kodak contour projectors covered in a booklet. Applications for optical gaging in the toolroom, on production line, in receiving, and in final inspection are also explained. Contact Apparatus and Optical Div'n, Eastman Kodak Co., Rochester 4, N. Y., for copies of this booklet, or — **Circle Inform-A-Gram No. B38.**

A New 180-Page Catalog gives sizes, ranges, capacities, and types of the complete line of speed reducers, custom gears, and commercial gears. Schematic drawings and engineering data are included. Write to Grant Gear Works, Inc., 154 W. 2nd St., Boston 27, or — **No. B39.**

Resinoid Bonded Snagging Wheels, for swing frames, automatics, floor stands, and portables, are discussed in a bulletin which lists the B-20 type wheel recommendations. Advantages are also given in this bulletin released by Macklin Co., Jackson, Mich., or — **Circle No. B40.**

An Automatic Way to Spray-Lubricate, Moto-Spray, is used for dies, molds, punches, and plungers on presses, upsetters, drills, and hammers. Advantages and different applications of this tool are described in a bulletin available from Renite Co., P. O. Box 8065, Columbus 1, Ohio, or — **Circle No. B41.**

Shoulder Type and Interchangeable Ball Seat Punches, ball seat, and press-fit die buttons, are among the items described in a catalog. Die buttons are available in 333 hole diameter sizes. Write to Pivot Punch and Die Corp., N. Tonawanda, N. Y., or—**Circle Inform-A-Gram No. B42.**

44-Ton to 600-Ton Capacity Hydraulic Presses are offered in a bulletin. Construction features include guided moving platen, cast or welded steel construction, self-contained pumping unit, adjustable stroke, and hydraulic pressure. Williams-White & Co., Moline, Ill., supplies copies of the bulletin. **Circle No. B43.**

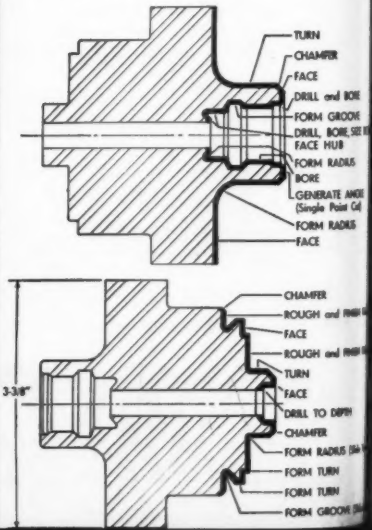
Let me show you*

* *George Marr,*
P&J Representative
Pawtucket, R.I.
Telephone PAwtucket 5-6500

how a change to
P&J Automatics
helped
American Bosch

JOB FACTS:

PART: *Head for Diesel Engine Fuel Pump.*
MATERIAL: *Nitralloy G, 28-35 Rockwell*
REQUIRED: *25 separate turning, facing, boring and forming cuts, with most surfaces held to .0015".*
THE MACHINES: *2 P&J 3-U "Speed-Flex" Automatic Turret Lathes.*
THE RESULTS: *Part completed in 2 fully-automatic cycles. Floor-to-floor time 5.5 minutes!*

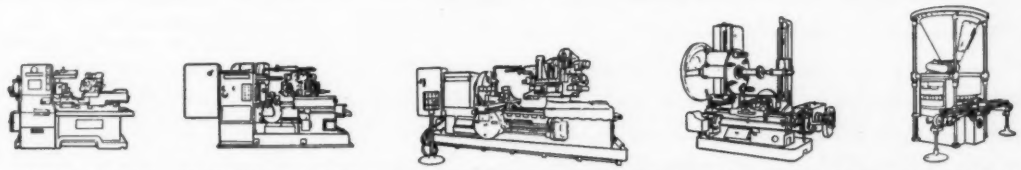


. . INCREASE PRODUCTION 45% AND REDUCE MAN-MACHINE HOURS 75%!

American Bosch Arma Corporation, one of the leading producers of automotive, electrical and diesel injection equipment, was using hand turret lathes to machine close-tolerance fuel pump heads. Two of these lathes – each with an operator – were working two 8-hour shifts per day, and a plant-wide survey showed that machining time and costs were too high. Called in to analyze the problem, we recommended two of our P&J 3-U "Speed-Flex" Automatics, with *both* machines to be operated by *one* man on a single 8-hour shift per day.

On the job 18 months, this installation has practically paid for itself in labor savings alone. Now, when the operator receives the workpiece, he chucks it in the first machine, and 12 cuts are completed in a single fully-automatic cycle. He then chucks the part in the second machine, and the remaining 13 cuts are completed. Floor-to-floor time is just 5.5 minutes . . . a 45% reduction over the old method. And 3 machinists have been released for other work.

If your manufacturing operations involve high-speed parts production, a switch from hand machines to P&J Automatics can also bring important benefits to you. Act today. Ask the P&J Representative in your area to analyze your requirements and recommend a production plan that meets your specific needs. If you prefer, write direct to Potter & Johnston Company, Pawtucket, Rhode Island.



AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

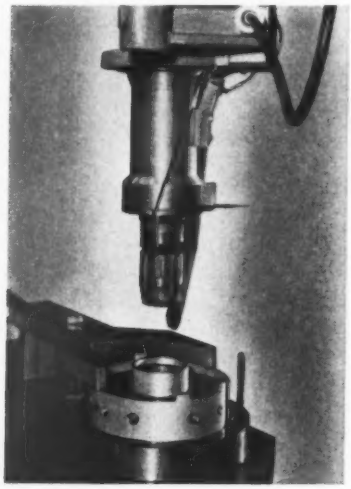
PRECISION PRODUCTION TOOLING SINCE 1898

CIRCLE INFORM-A-GRAM KEY NO. 95

Why MICROHONING

Provides Lower Cost — Consistent Accuracy — Maximum Production

Success of modern mass production invariably depends on complete interchangeability of parts. Thus, processing procedures that provide consistent accuracy at high production rates are required—Microhoning machines having automatic Microsize gaging assure "all parts are created equal" at a faster rate and at lower cost.



The variety of work piece and processing factors that influence automatic sizing are too diversified to be encompassed by a single gaging technique. Thousands of Microhoning applications have verified this fact. Therefore, through its continuing program of research and development, Micromatic has designed several automatic gaging devices—each provides advantages for specific types of use. Typical of features to be found in Microsize controls are the following two examples:

EXPANDING GAGE MICROSIZE

1 Gage wear held to a minimum—gage enters work collapsed.
2 Fine size adjustment through a range of .010" on diam.
3 Geometric accuracy—free-floating tool and/or part.
4 Diametric accuracy—.0003" or less.
5 No limit on maximum bore diameter to be gaged.

GAGE RING MICROSIZE

1 Simple to operate and maintain.
2 Geometric accuracy—free-floating tool and/or part.
3 Diametric accuracy—.0003" or less.
4 Gages bores from .120" to 4" diam.
5 Only honing tool enters bore—nothing to mar finish of soft surfaces.

The real answer to efficient automatic gaging is found in applying the right gaging technique to each job—it is here that Micromatic "know-how" can be of vital service to you.

Learn why Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____ K

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 96

Either Single or Combination Operations are possible with the Olofsson Model 30-012 standard single end precision boring machine highlighted in a bulletin. Chamfering, facing, turning, and grooving operations also can be done on this machine. Dimensions and diagrams are included. Write Olofsson Corp., 2739 Lyons Ave., Lansing, Mich., or — **No. B44.**

A Line of Milling Spindles for a broad range of production uses is presented in a bulletin. All models are hydraulically driven and feature constant horsepower over a variable-speed range. Construction, specifications, and operating characteristics are given in Catalog RT-58 from Romulus Tool and Engineering Co., 13581 Huron River Dr., Romulus, Mich., or — **Circle No. B45.**

Flame-Cutting Machines ranging in size from small portable machines to the large multi-blowpipe shape-cutting machines are highlighted in a 28-page catalog. Complete specifications for each machine, typical installations, and a list of machine accessories are included. Write to Linde Co., Div'n of Union Carbide Corp., 30 E. 42nd St., New York 17, for Catalog 4487, or — **No. B46.**

A Variable Height Loading Dock, the Portelvater, is a portable elevator which maintains constant level with truck beds. The 10' x 12' platform can form a bridge between platform and truck or a pigeon-hole for the fork truck during delivery of materials by overhead crane. Write to The Hamilton Tool Co., 832 S. 9th St., Hamilton, Ohio, for a copy of News Item 448-A/4337, or — **B47.**

Drawing and Forming, straightening, forcing, bending, reducing, etc. can be accomplished with the line of Elmes hydraulic metalworking presses described in a new bulletin. Electric control provides semi-automatic operation, automatic operations, and inching. For more information write for Bulletin 1010-C, Elmes Engineering Div'n, American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, or — **No. B48.**

A Superfinisher Catalog covers 15 models and three attachments for this method. Also included are sections on automatic size control, engineering service available, and floor plans for all models. The 44-page catalog also gives 34 different job applications. Write to Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis., for copies of Form 1169-B, or — **Circle No. B49.**

A Hand Feed Surface Grinder with 10" x 16" capacity is illustrated and discussed in a catalog. Construction features and specifications are described in this catalog which tells how additional vertical capacity is possible with 3" riser blocks. Harvel Co., 5135 Coffman-Pico Rd., Pico, Calif., publishes the catalog, or—**Circle Inform-A-Gram No. B50.**

Reclaim Diamond Dust with the diamond collectors described in a bulletin. Learn how the collectors operate on a centrifugal separating principle, and deposit the diamond-laden swarf in a clear, plastic container to save you money. Copies are available from Torit Mfg. Co., Dept. KP-1, Walnut & Exchange Sts., St. Paul, Minn., or — **Circle Inform-A-Gram No. B51.**

Clean Notches, no extra finishing, and no deformation are features of the super fast tube and pipe notching tool highlighted in a bulletin. Other advantages and a list of specifications are given in addition to descriptions of the different models. The bulletin may be obtained from Vogel Tool & Die Corp., 1825 N. 32nd Ave., Melrose Park, Ill., or — **Circle Inform-A-Gram No. B52.**

Data on Aluminum Characteristics, fabricating and finishing techniques, and mechanical and physical properties of alloys, is presented in a catalog. Also discussed are available products which include sheet, plate, coil, casting alloys, rod, bar, wire, etc. Bulletin G1-3D is published by Kaiser Aluminum & Chemical Sales, Inc., Dept. NR-4, 919 N. Michigan Ave., Chicago 11, or — **Circle Inform-A-Gram No. B53.**

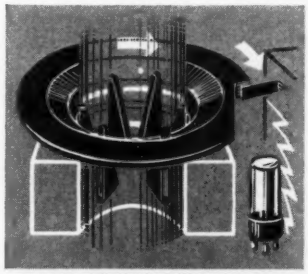
A New 25-Ton Capacity Chicago Press Brake for bending and forming sheet metal is the subject of a bulletin. The machine will bend 60" of 14 gauge or 72" of 16 gauge mild steel. Other advantages and specifications, along with detailed drawings, are included. Bulletin 265-58 is available from Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, or — **Circle Inform-A-Gram No. B54.**

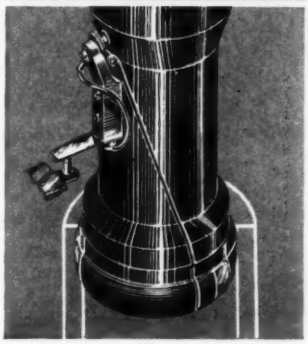
The Worksaver Line of Lift Trucks, produced in pallet, platform, stacker, and tractor models, are described in "The Inside Story of Yale Worksavers." This bulletin has cutaway pictures to show operational features. Write to Yale Materials Handling Div'n, The Yale & Towne Mfg. Co., 11,000 Roosevelt Blvd., Philadelphia 15, or — **Circle No. B55.**

How MICROHONING Provides Lower Cost — Consistent Accuracy — Maximum Production

Inherent characteristics of the Microhoning process are: rapid stock removal —generation of geometric and dimensional accuracy—ability to produce any desired functional surface finish. By using automatic Microsize controls, Microhoning's economies for precision processing can be fully utilized.

Today, there are several different types of automatic Microsize gages. The type best suited for individual applications can only be determined by considering the workpiece and processing factors. How automatic cycling of Microhoning machines is accomplished by using Microsize gages is indicated by the following typical examples:





GAGE RING MICROSIZE

The gage ring, which is mounted above the workpiece, has an I.D. equal to required bore diameter. When bore has been Microhoned to size, plastic tabs on the abrasive sticks contact I.D. of gage ring causing it to turn. This movement triggers an air switch or an electronic pickup to initiate the ending of Microhoning cycle. Production-proved diametric accuracy on bores from .120" to 4" in diameter is .0003" or less.

EXPANDING GAGE MICROSIZE

This gage reciprocates in synchronization with the Microhoning tool but is not attached to it. Entering the bore on every downstroke of the tool, the gage expands only at the bottom of each stroke. When gage expands to required bore diameter, two preset electrical contacts meet and initiate the ending of Microhoning cycle. There is no limit on maximum bore diameter that can be gaged—diametric accuracy held to .0003" or less.

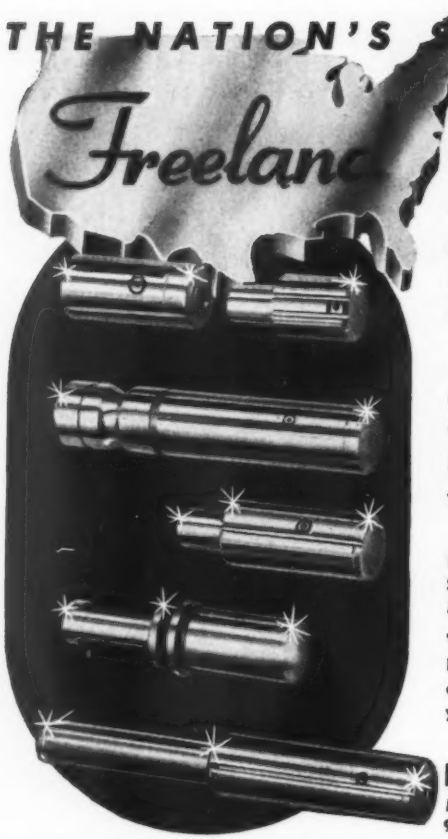
To most efficiently meet each automatic sizing requirement, Micromatic employs a wealth of experience in the use of air, liquid, electronic and mechanical controls.

☐ Please send me your movie "Progress in Precision" in time for showing on _____ (date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____ K

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

THE NATION'S STANDARD FOR ACCURACY



Standard AIR GAGES

• Pioneers in the air gaging field and the largest producer of AIR GAGE MEMBERS FOR ALL CIRCUITS, the Freeland organization offers a combination of high quality, low cost and fast delivery on all types of air gage members.

• In chrome, steel or carbide . . . through hole, blind hole or special . . . flow, differential or back pressure . . . all of these are available at Freeland. Whatever your requirements in air gaging, specify FREELAND! Order the nation's standard for accuracy now!

FREELAND RECONDITIONING SERVICE FOR ALL AIR GAGE MEMBERS

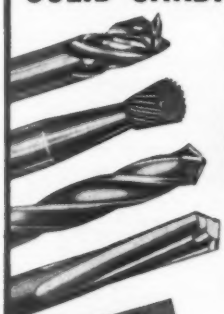
Whatever the type or condition, Freeland craftsmen can renew that air gage member. Let us show you . . . Send it in!

VALUABLE REFERENCE GUIDE AVAILABLE
The Freeland GENERAL REFERENCE AND ORDER GUIDE—Air Gage Members For All Circuits, can be yours without obligation. Write today.

FREELAND GAUGE COMPANY
Precision gaging • *Precision Tooling* • *Precision Production*
9936 FREELAND • DETROIT 27, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 981

"Raymac"
SOLID CARBIDE CUTTING TOOLS

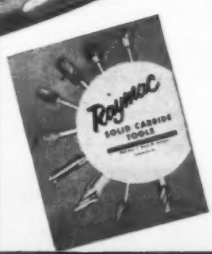


• MIDGET BURRS • ROTARY FILES
• DRILLS • REAMERS • END MILLS
• COUNTERSINKS • GRINDING
TOOLS AND OTHER SPECIAL TOOLS

Up to 25% Longer Life

Finest quality solid carbide ground and lapped to the sharpest cutting edges make "Raymac" tools the quality standard of the industry. More parts produced per tool and per regrind.

Make "Raymac" your standard.



GET OUR CATALOG NO. 15

"Raymac" Division—DEXCO CORPORATION
15490 Dale • Detroit 23, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 982

CAN THIS BABY CUT!

SIZE
8" x 11" x 7½"

CAPACITY
3/16"
MILD STEEL

WEIGHT
41 LBS.

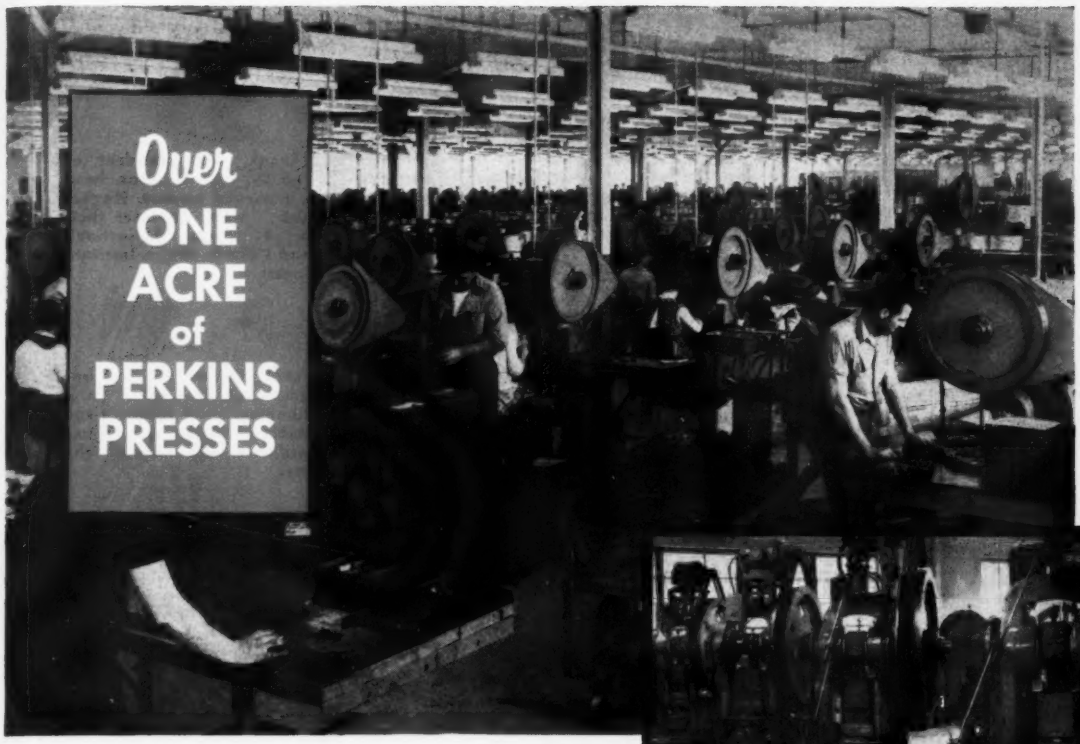
LENGTH
OF BLADE 5"

WHITNEY-JENSEN
No. 38 Throatless
BENCH SHEAR

Write for BIG NEW CATALOG

WHITNEY METAL TOOL CO.
712 FORBES ST., ROCKFORD, ILL. SINCE 1910

CIRCLE INFORM-A-GRAM KEY NO. 983



175 PERKINS BLANKING PRESSES

USED IN NEW PLANT OF ACME CHAIN CORP.

Acme, one of the fastest growing chain manufacturers in the country, has installed a battery of over 175 Perkins Blanking Presses in their new plant at Holyoke, Mass.

The phenomenal growth of Acme Chain has been attributed to superior service and a top quality precision product. Perkins Machine Company is proud that its equipment was selected as a part of the Acme precision operation.

PERKINS MACHINE COMPANY
WARREN, MASS., U.S.A.

The Presses With The Big Difference

Perkins manufactures a full line of O.B.I. presses, blanking presses, straight side single and double crank, transfer presses, deep throat presses, back flywheel presses and many other models for press work of all kinds.

Illustrated Catalog
Sent upon request
Write Dept. TP-1

CIRCLE INFORM-A-GRAM KEY NO. 99

MANUFACTURING MEMOS

Becomes Fellow . . .

• In recognition of "acknowledged engineering attainments", Oswald S. Carliss, director of engineering of Yale Materials Handling Division, The Yale & Towne Mfg. Co., was elevated to the grade of Fellow. Of the 44,000 members of the American Society of Mechanical Engineers, only 450 engineers hold this distinction.

Customer Service . . .

• The establishment of a customer machine rebuilding program has been announced by The Bullard Co. Customers and users are offered these advantages when rebuilding Bullard machine tools: know-how, genuine replacement parts, all work done by factory-trained assembly personnel, and full year's guarantee on all parts replaced.

New Division . . .

• Formation of the Hydraulics Division of the Brown & Sharpe Mfg. Co. has been announced by the company. The new division combines three previously independent companies — Brown & Sharpe's former Hydraulic Products Division, the Double A Products Co., and the power unit portion of the Rosaen Co. General manager of this division is Herbert H. Upton.

Award Announced . . .

• Plans for the 1958 Gregory Award for the year's outstanding contribution to the advancement of electric arc stud welding are revealed by Gregory Industries, Inc. Significant contributions will be judged on the basis of reducing costs for industry; improving appearance, serviceability, and life of a product or structure; and performing a function not possible by any other method.

Fellowships Established . . .

• A $100,000 graduate study grant to the Foundry Educational Foundation was announced by Wheelabrator Foundation. These fellowships are to be used for graduate study in the cast metals field, or other areas. Fifty fellowships of $1,000 each will be issued during the next ten years, and $25,000, can be used by F.E.F. for fellowships, scholarships, or other educational purposes.

Three Receive Award . . .

• The Navy Meritorious Public Service citation was awarded to three men with more than 65 years experience among them. T. C. Wisenbaker, Thomas L. Phillips, and Joseph H. Leiper of Raytheon Mfg. Co. were honored for outstanding contributions to the Navy in the field of guided missile technology.

Robert J. Shank, vice president of engineering, and Dr. Harold Lyons, head of atomic and molecular physics, Hughes Aircraft Co., were cited for their "achievements of special distinction" and were named Fellows of the Institute of Radio Engineers.

◆

Bryant Chucking Grinder Co. has become a subsidiary of Ex-Cell-O Corp. Through the combination of facilities and skills the products of Bryant can be expanded to coordinate with those of the parent company.

◆

Announcement of the acquisition of the precision tool component line of VON Industries, Inc. by PIC Design Corp. has been made known.

◆

Clark Equipment Co. has agreed to acquire all the capital stock of Brown Trailers, Inc. The purchase represents a further extension of Clark's activities in the materials handling field.

◆

All Buffalo and Niagara Frontier defense products activities of Bell Aircraft Corp. are now coordinated with the establishment of Bell's Niagara Frontier Division. Ray P. Whitman, first vice president of the corporation, will be general manager of the new division.

◆

Harvey Aluminum is the new name of Harvey Machine Co., Inc. Because the company has grown and expanded in the aluminum industry, the change was needed to more closely identify the company with its products.

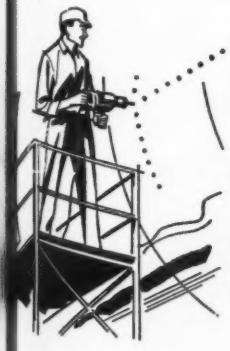
◆

A "certificate of management excellence" was awarded to The Maytag Co. by the American Institute of Management recently.

◆

The total acquisition of Missile-Air by United States Chemical Milling Corp. has been announced. This purchase permits United States Chemical Milling, a subcontractor to aircraft and missile manufacturers, to incorporate some of the latest and newest fabricating techniques such as special spinning, as well as shearing and forming.

CHICAGO-LATROBE...helping Douglas usher in the jet transport age



The Douglas DC-8 is one of the most amazing airplanes ever conceived. Designed to carry well over 100 passengers at near-sonic speeds, it promises to revolutionize our patterns of travel. They'll be in use on the airways soon.

Long a supplier to the Aircraft Industry, Chicago-Latrobe has pioneered in the development of drills and reamers to meet jet age needs—from deep hole drilling of Safety Plexiglass for pressurized cabins to tough high tensile stainless steel drilling and reaming applications. Our engineers cooperating with the distributors and users have helped in the development of these special tools for today's requirements.

This combination of tool-wise distributors and trained factory engineers stands ready to help *you* at any time. Just remember C-L . . . Chicago-Latrobe.

CHICAGO-LATROBE

422 W. ONTARIO STREET, CHICAGO 10, ILLINOIS

ORDER THROUGH YOUR LOCAL C-L STOCKING DISTRIBUTOR

The Complete Drill and Reamer Line

INDUSTRIAL DISTRIBUTORS SERVING INDUSTRY ECONOMICALLY

DRILLS • REAMERS • END MILLS • COUNTERSINKS • COUNTERBORES • CARBIDE TOOLS

Quality Control at Pipe Machinery

Rests Right Between Each Operator's Ears

At Pipe Machinery we have no need for floor inspectors . . . no need for control charts to insure the high precision and accuracy of our gages. Our quality control rests where it belongs—right between the ears of the people who do the actual work. Through every step in the manufacture of a Pipe Machinery gage, all our operators feel full and complete responsibility for the quality of the product they are helping to produce. Each man and woman is a self-appointed guardian of the company's reputation. They all have their own inspection equipment. We also maintain a fully equipped constant temperature laboratory where large gages and extremely close tolerance gages are checked.

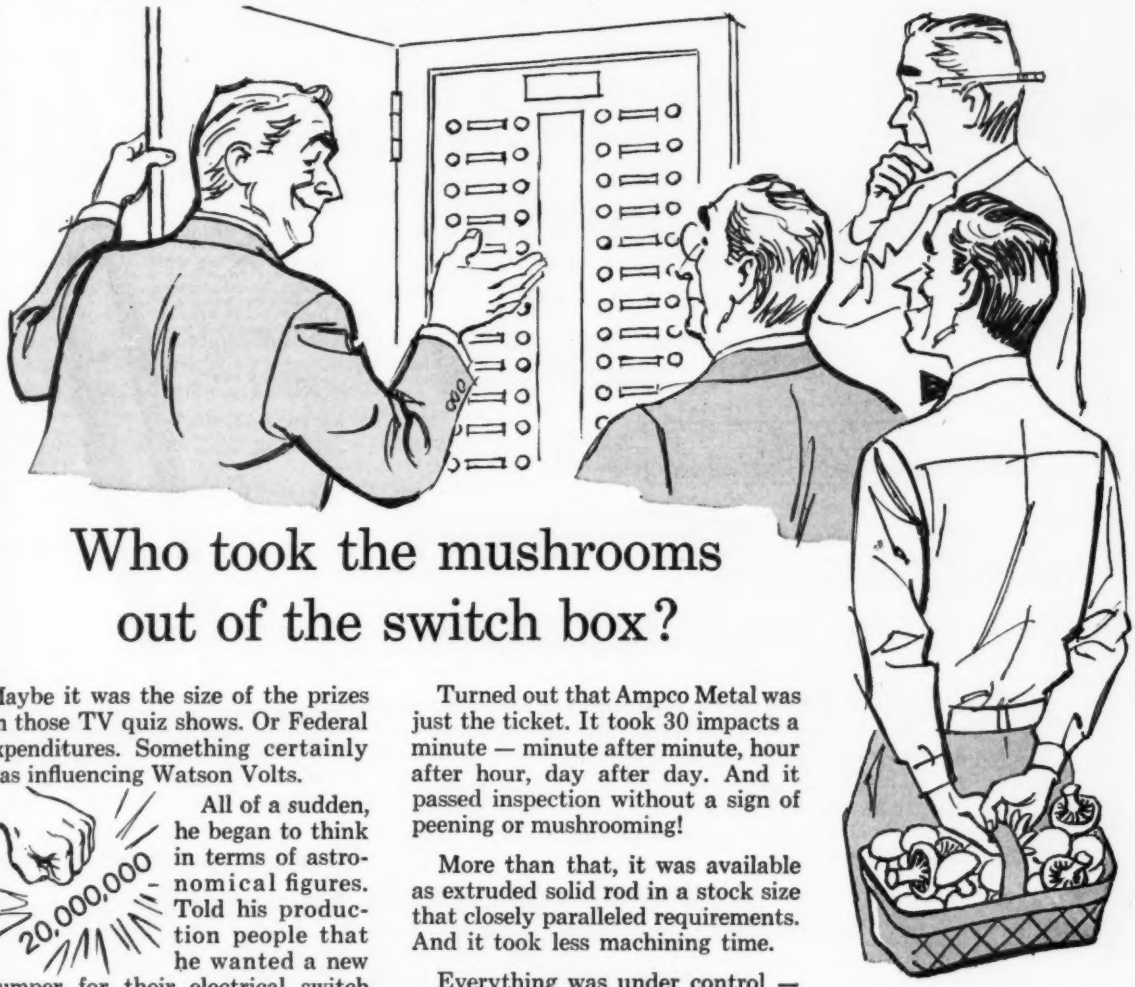
Do stop in and visit us next time you are in the vicinity. We'd be proud to introduce you to our team of reliable craftsmen . . . a team devoted heart and soul to the job of turning out gages of unsurpassed excellence.

For further information on our complete line of fine gages, write us on your letterhead.

THE PIPE MACHINERY COMPANY *29100 Lakeland Blvd. • Wickliffe, Ohio • Greater Cleveland*

CIRCLE INFORM-A-GRAM KEY NO. 102

Any similarity to a real-life company is purely intentional



Who took the mushrooms out of the switch box?

Maybe it was the size of the prizes on those TV quiz shows. Or Federal expenditures. Something certainly was influencing Watson Volts.

All of a sudden, he began to think in terms of astronomical figures. Told his production people that he wanted a new bumper for their electrical switch box. One that would take 20,000,000 (yep, that's right — twenty million) impacts! And do it without appreciable wear!

Like the hermit who saw a giraffe for the first time, the production manager said, "There ain't no such animal!" Suspecting, of course, that he'd eventually find that there was. Which he did.

Somewhere along the line, A Samaritan told the p.m. about Ampco Metal. About how it is a whole series of uniform-quality copper-base alloys engineered to meet a wide range of special-duty requirements.

Turned out that Ampco Metal was just the ticket. It took 30 impacts a minute — minute after minute, hour after hour, day after day. And it passed inspection without a sign of peening or mushrooming!

More than that, it was available as extruded solid rod in a stock size that closely paralleled requirements. And it took less machining time.

Everything was under control — including costs!

Ampco Metal extruded solid rounds combine high strength and hardness with exceptional resistance to wear, fatigue, and corrosion.

Companies in many fields regularly use extruded solid rods of Ampco Metal — for bearings, bushings, worms, gears, and other vital parts.

Your Ampco stocking distributor can supply diameters from ⅛" to 5⅜". Call him for prompt service. If you don't know who he is, write us for his name. *Ampco Metal, Inc., Dept. TP-5, Milwaukee 46, Wis. (West Coast Plant: Burbank, Calif.)*

AMPCO® METAL

The metal without an equal

RM-7

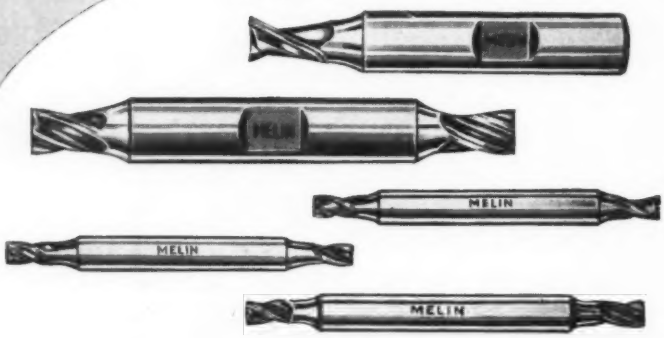
CIRCLE INFORM-A-GRAM KEY NO. 103

MELIN

STUB LENGTH END MILLS
with flutes shorter than regular

Offer GREATER STRENGTH...*

TWO, THREE AND FOUR FLUTE



...★ *Plus an Exclusive*... In addition to manufacturing a *complete* line of End Mills, the Melin Tool Company makes several standard *Stub Length Mills* exclusive of other tool manufacturers.

The new Melin Tool Catalog No. 54-C lists the specifications on these *all inclusive* Stub Length Tools... and... they offer greater strength and less breakage. Write for your catalog . . . today.

Representatives in Principal Cities

MELIN TOOL COMPANY, INC.

3371 West 140th Street
Cleveland 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1041

LEIGH Long Carbide Insert SCRIBERS

NOT A CHIP
NOT A TIP
BUT A LONG INSERTED CARBIDE ROD

Leigh Scribers are lifetime tools. Each has a 3/64" dia. solid carbide rod insert that is 3/8" to 1/2" long and which can be re-ground many times (as you can re-sharpen a pencil). Points are ground at correct angle to combine maximum visibility and convenience with proper support. Points are also protected in shipment with peal-off, seal plastic coating.

SCRIBERS FOR EVERY NEED:

No. 200 Economy Scribers with carbide rod insert, brazed in black finish steel body
$1.00

No. 676 Collet Scriber, Point reversible for pocket safety. Aluminum body. Precision steel collet.
$1.50

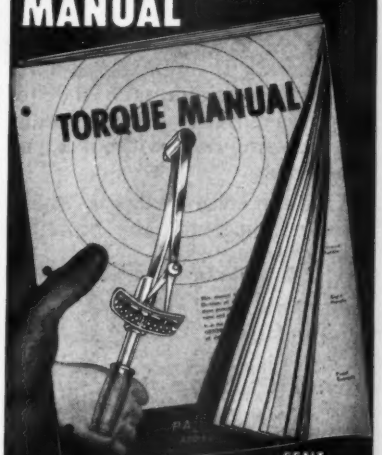
If your tool house can't supply, order direct. Write for catalog.

Also a full line of replaceable, carbide insert and high-speed steel points are available in straight-reversible, and 45° and 90° angle types.

SPRING SPECIALTY CO. 23 No. 5th Ave MAYWOOD, ILL

CIRCLE INFORM-A-GRAM KEY NO. 1044

"TORQUE WRENCH" MANUAL



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Formulas
Applications
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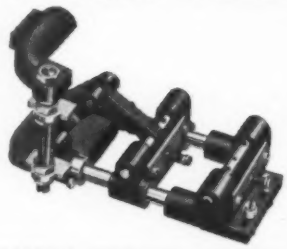
Screw Torque Data
Adapter Problems
General Principles

PA STURTEVANT CO
ADDISON QUALITY ILLINOIS
Manufacturers of over 85% of the torque wrenches used in industry

CIRCLE INFORM-A-GRAM KEY NO. 1045

A SURE FEED



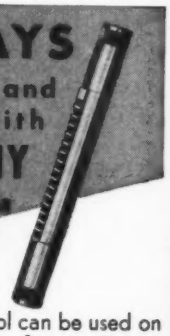
PRODUCTO AUTOMATIC "SUREFEED"

Your pressroom can produce more with this compact, durable stock feed. Can be mounted right on die set to save you time. Direct linkage feeding affords greater accuracy. Comes in 2" and 3" sizes. Write for detailed bulletin on this cost-cutter.

THE PRODUCTO MACHINE CO.
970 Housatonic Avenue
Bridgeport 1, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 1042

KEYWAYS
—ACCURATE and UNIFORM with
The GLENNY
Adjustable Expansion
PUSH BROACH



because . . .

this sturdy simple tool can be used on any type arbor press for continuous efficient keyways — in any quantity

COSTS OFTEN REDUCED AS MUCH AS 10 TIMES

SEND FOR BULLETIN

DEALERS ALSO WRITE DEPT. TP-5

The Baj Tool Company
19751 ST. CLAIR AVE.
CLEVELAND 19, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1043

3 WAYS YOU CAN KEEP AHEAD OF COMPETITION

A BETTER PRODUCT . . . AT LESS COST . . . through ADVANCED GAGING!

Profit margins aren't getting any better . . . just the opposite. It's no longer a matter of "getting the stuff out". The problem now is making it *better at lower cost.* Advanced gaging—by FEDERAL—can do it. The gaging ideas are proven profit makers. The gages, far from being monsters of automation, are compact, standardized units, realistically designed to provide automatic control or inspection, or both, where it does the most good and at a price that almost *every* manufacturer can afford. And they have reliability . . . the most important single feature of FEDERAL Gaging.

Whether you're big or small in terms of production, *at least one of these gaging arrangements can pay off for you.* It's the truth. Ask us to prove it. Write:

FEDERAL PRODUCTS CORPORATION
8235 Eddy Street • Providence 1, Rhode Island

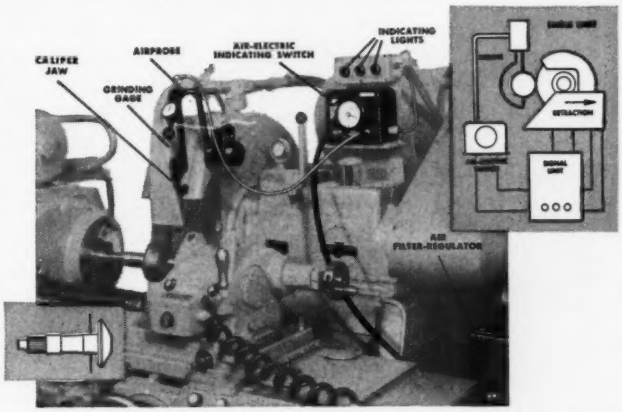
① AUTOMATIC CONTROL OF FINISH SIZE

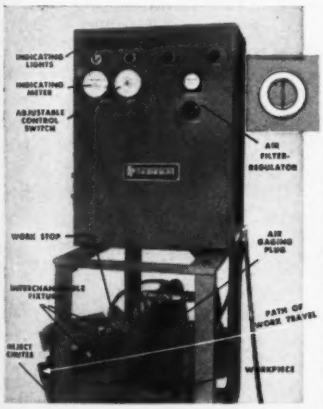
This standardized control gage continuously measures and indicates size of work as it is being ground and automatically causes wheel to retract the instant finish size is reached. Unit can be easily applied in the field to any center type grinder having hydraulically controlled wheel slide.

BENEFITS: Reduces costs — one operator handles two, possibly three grinders performing the same or different operations. Gages pay for themselves within a few months.

Improves quality — even if you have only one grinder, gage is a profit-maker because it eliminates error due to operator inattention or fatigue and also eliminates cost of later inspection.

VARIATIONS: Similar FEDERAL Gages are available through machine tool manufacturers to change wheel feed rate to dwell grind also . . . or to control dressing cycle and finish size on I.D. grinders. When specifying machine tool requirements be sure to include Federal gaging.



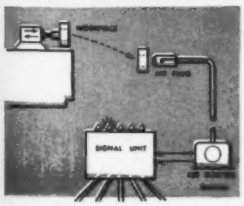


② AUTOMATIC 100% INSPECTION

This standardized "post-process" gage inspects every part as it is discharged from the machine and sorts work into "good", "*near*-over", "*near*-under" plus "salvage" and "scrap", indicating the size of each piece. Operator can compensate for drift and piece-to-piece variation *before any scrap parts are produced.* Can be applied to any type I.D. or O.D. grinder, lathe, boring machine or screw machine.

BENEFITS: Lower cost per part. Virtually eliminates scrap by showing trend *before* tolerance limits are reached.

Eliminates inspection errors — gage has 99.8% reliability or better.



VARIATIONS: Federal Gages of similar type are available through machine tool manufacturers to also provide automatic compensation of the machine, either proportionally or by increments, so that drift is corrected without need for operator attention. Be sure to specify Federal Gaging when buying machine tools.

③ SEMI-AUTOMATIC, MULTIPLE DIMENSION MEASUREMENT

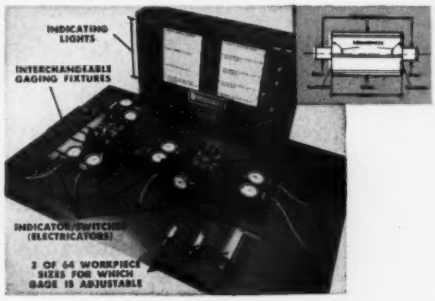
Ideal for small and medium production manufacturers, this gage checks nine dimensions in two stations and is adjustable for 64 sizes! Work is loaded and disposed of manually. Lights show "good", "over" and "under".

BENEFITS: Reduces non-productive costs—inspection time per part is reduced 75%.

Improves quality level. Permits profitable 100% inspection.

Inspection can be performed by less skilled personnel.

VARIATIONS: Can be designed to provide virtually any combination of dimensional measurements. Unit can incorporate semi-automatic disposal. Other design possibilities up to a completely automated inspection and control gage.


INDICATING LIGHTS
INTERCHANGEABLE GAGING FIXTURES
INDICATOR SWITCHES (ELECTRICATORS)
2 OF 64 WORKPIECE SIZES FOR WHICH GAGE IS ADJUSTABLE

Ask FEDERAL *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

CIRCLE INFORM-A-GRAM KEY NO. 105

MICRO MILLING CUTS PRODUCTION TIME 31½ HOURS ... INCREASES TOOL LIFE 300%

Precise

SUPER-SPEED POWER QUILL

Sizing an aluminum cavity to .001" tolerance on a die for a rotary process machine at R. P. Scherer Ltd., Windsor, Ontario, was a simple operation for a PRECISE Super 80 POWER QUILL. This Super-Speed POWER QUILL —mounted on a standard machine tool—not only held the prescribed tolerance but cut production time 31⅓ hours and increased tool life 300% over previous machining methods.

PRECISE Super-Speed POWER QUILLS meet every production and toolroom requirement and are quickly mounted with PRECISE mounts on standard and special machine tools. They mill or grind the hardest alloy steel, soft plastic, wood and rubber, aluminum, Masonite and even glass. Their superhigh speeds, high torque, spindle and chuck rigidity permit the use of the hardest cutting tools for faster stock removal, improved surface finishes, maximum tool life, and the maintenance of tolerances to .0001". Adjustable spindle speeds range from 15000 rpm to 45000 rpm with power ratings up to 1⅓ hp from ordinary 110v or 220v power supplies.

Mail coupon below for complete information on the entire line of PRECISE Super-Speed MICRO TOOLS.

PRECISE PRODUCTS CORPORATION, Racine, Wisconsin, U. S. A.
Branch Plant: Precise, G. m. b. H., Duesseldorf, Germany

Quality and Precision Since 1882

Precise

Power Quills Grinder Millers Milling Machines Accessories
Rotary Cutting Tools Vapor-Lub Cooling Systems

PRECISE PRODUCTS CORPORATION, 3735 Blue River Road, Racine, Wisconsin
☐ Send complete information on Precise Tools. ☐ Have salesman call.
Also send data on Precise ☐ Cutting Tools, ☐ Vapor-Lub Cooling.

Name_____Title_____

Company_____

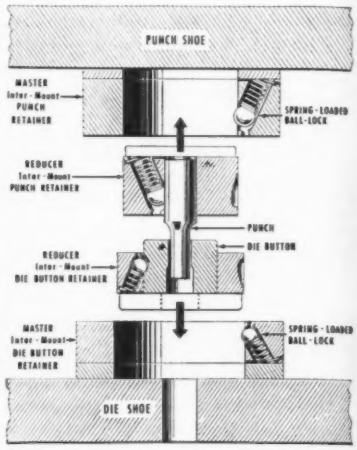
Address_____

City_____Zone_____State_____

CIRCLE INFORM-A-GRAM KEY NO. 106

SPRING RETAINERS SIMPLIFY AND SPEED PUNCH, DIE MOUNTING

New retainers developed by Richard Brothers Punch Division of Allied Products Corporation extend the interchangeability of their punches and dies and cut downtime when changing from one production run to another. They make it possible to insert different sizes and shapes of punches and die buttons in already mounted retainers. Any punch with shank diameter from ½" to 2¾" can be mounted in one Inter-Mount master retainer.



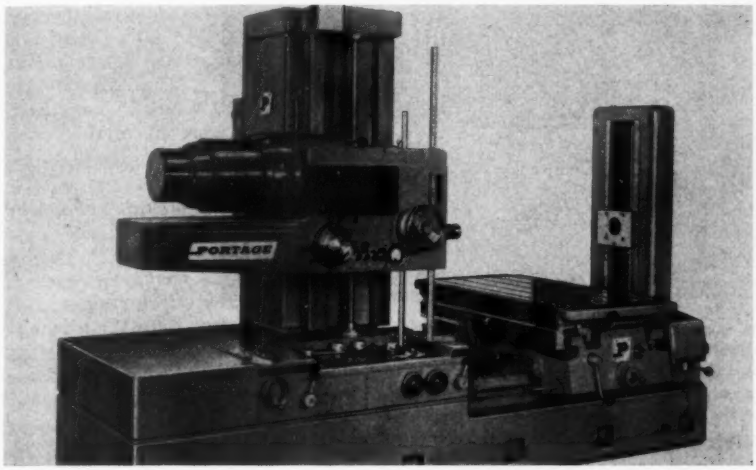
Reducing retainers for punches and die buttons are inserted in a master retainer. The hole in this master and OD of the reducing retainer are identical regardless of punch or die button size. The only dimension variable in the reducing retainers is the ID, which matches punch shank diameters or die button OD. Thus, the master punch retainer holds every size reducing punch retainer. The same is true for die button retainer sets.

When changing from one press run to another, if the original location of the retainer set is proper for the second run, it is therefore simple to remove the one size punch and die buttons and insert the new size ones. There is no unbolting of old retainers, relocating, drilling, tapping, and bolting for a new setup.

Your Inform-A-Gram Card follows page 162 in this issue. It is for your convenience in making inquiry about advertised products or editorial items.

ECONOMICAL MACHINING PERFORMED ON NEW VERSATILE MACHINE

The all new Portage horizontal milling, drilling, and boring machine is a versatile, multi-purpose machine. It is designed and built for economical, fast and dependable work. Workpieces of many sizes, shapes, and materials can be machined on this new 3"-spindle machine. The new construction and control arrangement permits fast positioning and handling on both long or short run lots, at a minimum cost. A wide range of spindle speeds and infinitely variable head, table, and saddle feeds permit selection of the best combination for any specific operation. Strength, rigidity, and precision are built-in features making the machine suitable for toolroom use or general production.



Separate spindle drive and feed drive motors offer a maximum of power to the cutting tools at all speeds and provide a flexibility of feed motions required for economical tooling. Infinitely variable feed rate control permits control of surface finish and chip load. The feed rate setting is shown on a dial and can be preset before engagement of the head, table, or saddle feed. Feed rates can be changed at the operator's option while feeding, even with the cutting tool under load. An extra low range feed shift is provided on the saddle feed for fine boring. Full range of saddle feed is from 30.0 to 0.03 ipm.

A fine feed handwheel with adjustable micrometer dial graduated in 0.001" with 0.100"/turn and a coarse feed handwheel with push-in engagement and snap-out disengage button provides full control of spindle feed. The feed drive for movement of the head, table, and saddle is by separate motor in the bed and is infinitely variable for selection of optimum feed rates.

Power feed of the table permits machining close to the head with minimum spindle overhang. The end support block, when needed, is geared to track exactly with vertical travel of the spindle for additional accuracy.

Electrical control from a pendant can be had for remote pushbutton selection of feed drive to head, table, and saddle, selection of direction, and feed or rapid traverse. With this control approach, cutting times are shorter for floor-to-floor worktime.

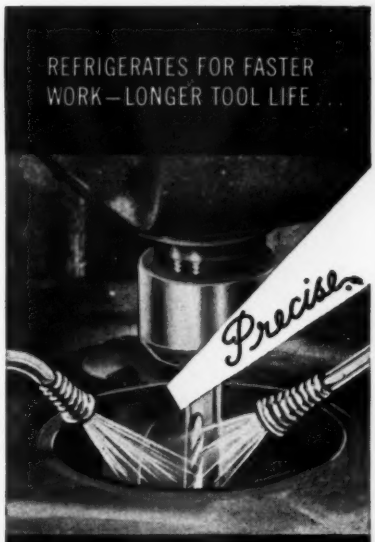
For descriptive literature write The Portage Machine Company, 1046 Switzer Avenue, Akron 11, Ohio, or **Circle Inform-A-Gram No. D3.**

NECROLOGY

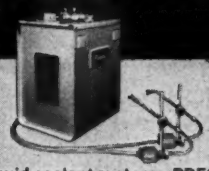
James A. Scully, 81, board chairman of Scully-Jones and Company, died Apr. 6 at his LaGrange Park, Ill., home.

William J. Cook, 68, recently retired president of Hunter Spring Company, died Apr. 6 at the North Penn Hospital in Lansdale, Pa.

Sheldon K. Towson, president of The Elwell-Parker Electric Company, Cleveland, died in April after a three-month illness.



VAPOR-LUB COOLING



Unlike liquid coolant systems, PRECISE Vapor-Lub refrigerates and lubricates the entire cutting area for maximum cutting efficiency. By sudden expansion of compressed air through a precision nozzle, the entire cutting area temperature is reduced up to 20 F below room temperature. In addition, an atomized coolant spray is deposited on tool and work to lubricate and minimize frictional heat for increased tool life, faster work, improved surfaces, and maintenance of closer tolerances.

Vapor-Lub cooling is clean . . . simple . . . and economical...requires no special plumbing or coolant pans . . . can be installed in seconds on any machine. Available with single or multiple jet nozzles for every cooling requirement. Single unit $47.50; double unit (shown) $69.50.

Send coupon for complete information.

PRECISE PRODUCTS CORPORATION
Racine, Wisconsin, U.S.A.
Branch Plant: Precise, G.m.b.H.
Duesseldorf, Germany

Precise

Power Quills Grinder Millers Milling Machines Accessories Cutting Tools
Vapor-Lub Cooling Systems

Quality and Precision Since 1882

Precise Products Corporation
3735 Blue River Road
Racine, Wisconsin

We are interested in PRECISE Vapor-Lub. Send one complete ☐ single jet unit @ $47.50, ☐ double jet unit @ $69.50. ☐ Have salesman call for demonstration. ☐ Send complete information.

☐ We also desire data on entire line of PRECISE Super-Speed Micro Tools.

Name_____Title_____

Company_____

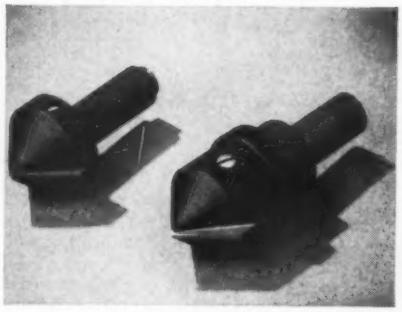
Address_____

City_____Zone___State_____

CIRCLE INFORM-A-GRAM KEY NO. 107

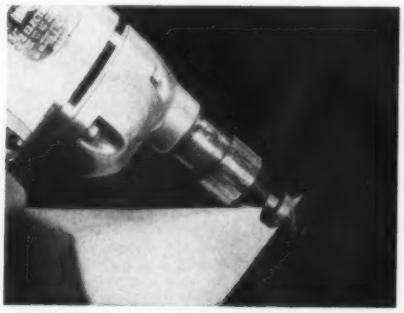
INGENIOUS NEW... UNIVERSAL R&R DEBURRING TOOL

with spring loaded retractable blade eliminates chatter gives precision-cut edge or chamfer at high speed



The cutting action of Model 955 Universal R&R chatterless Deburring Tool (on the left) is effected by spring tension against the blade. On Model 956, right, the spring tension is against the body. This is adjustable to regulate the depth of cut. The blade is free-floating to allow self-alignment and uniform stock removal.

The new Universal R&R Tool makes a handy horizontal deburrer when used with a portable drill held in a vise. With proper adjustment, the R&R Deburring Tool is CHATTERLESS. A new design allows the bearing angle of the tool body and the blade to be in continuous contact with the work piece at all times.



R&R Deburring Tool used in electric drill as a portable unit for heavy plate or other objects too heavy to handle. Blades of the R&R Deburring Tool are replaceable at nominal cost from stock. They are made of high speed steel, precision hardened and ground to close tolerances for interchangeability.

Used in any standard drill press at the high operating speeds recommended by the makers of high speed steels, the R&R Deburring Tool performs most efficiently. High operating speeds mean more production, lower costs. Each tool is made in a full range of sizes to 1½" diameter.

UNIVERSAL ENGINEERING COMPANY

209

FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 108

FILMS TO SEE

More than 70 films describing American work simplification and industrial engineering techniques are included in the 1958 edition of the Industrial Management Society film rental catalog. The 16mm films are 10 to 15 minutes long, and picture before and after phases of training methods and work simplification projects in both plant and office operations. Write to Industrial Management Society, 330 S. Wells St., Chicago 6, for a copy of this booklet.

"High Production Press Maintenance" describes proper maintenance procedures for high speed presses, including lubrication, adjustment, and checking for clearances. The film features the simple die change-over method, which makes it possible to use such presses even for short runs. Contact E. W. Bliss Co., Canton, Ohio, for more information.

Economies of proper tape usage and advantages of mechanically dispensed and applied pressure sensitive tapes are described in a 32-min movie. "Two Billion Rolls" shows applications which include labeling chain automatically with tape labels. Minnesota Mining and Mfg. Co., 900 Bush St., St. Paul 6, Minn., will answer inquiries about the film.

"Key to Machining Versatility" is a color motion picture which depicts the versatility of the Bullard Hydra-Feed lathe as a tracer or multiple tool model. This 14-min film is available for free loan from The Bullard Co., Bridgeport 9, Conn.

The advantages of using Flexoprint to produce or revise lists of all kinds are pointed out in a movie entitled "This is Flexoprint." The 16-min, 16mm color film demonstrates the time, cost, and work-saving advantages of Flexoprint as compared to expensive typesetting methods. Arrangements for loan can be made through Remington Rand, 315 4th Ave., New York 10.

Photoelastic studies of joined section in castings and weldments is the subject of a 27-min, 16mm film which reveals the photoelastic properties of both the cast and welded corner sections, and compares the results with actual fatigue test specimens. Information for obtaining the movie is available from the Product & Market Development Committee, Steel Founders' Socity of America, 606 Terminal Tower, Cleveland.

F-G-M STORAGE PLANNING
...GETS MORE INTO LESS SPACE
...CUTS HANDLING TIME SHARPLY!

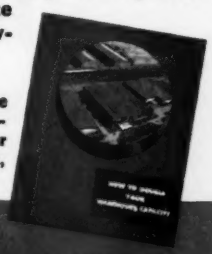
Up to 75% savings in floor space have been realized by conversion to Rotabin planned storage!

F-G-M Warehouse Racks 9 feet wide for heavy loads.

Operations involving costly machines and highly skilled labor can no longer be supported economically by sprawling, inefficient storage methods.

Ask Frick-Gallagher how F-G-M Storage Planning can save manpower inside and outside of storage areas, provide greater accessibility in less floor space, and reduce your factory cost. F-G-M experience and know-how are available to you for the asking.

Send today for your free copy of Brochure 700-A on "How To Double Your Warehouse Capacity." The Frick-Gallagher Mfg. Co., 106 S. Michigan Ave., Wellston, Ohio.



FRICK-GALLAGHER
BONDERIZED
STEEL EQUIPMENT
FOR EVERY STORAGE NEED

ROTABINS | STEEL SHELVING | WAREHOUSE RACKS | COUNTERS | SPECIALTIES

CIRCLE INFORM-A-GRAM KEY NO. 109

STANDARD
PORT CONTOUR CUTTERS
Stocked for Immediate Shipment

Combines 5 Operations in One
All Tolerances
Well Within
AND 10050—MS-33514—
MS-35515 Specifications

A complete line of combination ream, counterbore and facing tools to form AND-10050 standards. Tube size 2 thru 32 carried in stock. Also tools for MS-33514 and MS-35515 carried in stock sizes 2 thru 20. Special tools made to order.

WETMORE TOOL & ENGINEERING CO.
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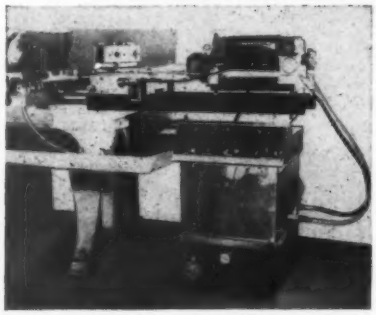
ACME HYDRIVE
increases production up to **100%**



. . . and makes a hand operated turret lathe dependably automatic.

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ADDRESS_____
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LOW COST
Standard Flush Pin Gages
and Dial Indicator Gage Units

Choose the standard flush pin gages you need from over 650,000 variations catalogued by Rite-O. You'll get easier ordering (by composite number, no drawings), and real savings (Rite-O prices are lower).

The Rite-O dial indicator housing is a standard reusable unit, with a full ⅜-inch vertical adjustment of the indicator. It is available alone or as part of a full line of indicator depth gages (pictured).

WRITE TODAY! Get the Rite-O Flush Pin Catalog, with 16 pages of tables and prices. Enjoy first-quality gages that are lower in cost and easier to order.

RITE-O TOOL & GAGE COMPANY
321 West Ten Mile Road • Hazel Park, Michigan
Rite-O
Precision manufacturers of plain and threaded plug and ring gages, indicator depth gages, and special gages and fixtures

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HARDENED and GROUND HSS BLANKS
Any decimal diameter — any length. Mirror finish surface to gage tolerance.
Many uses —
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Large Precision Machining
Done to your specifications
We Have
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has been done with the SCLEROSCOPE
Since 1907
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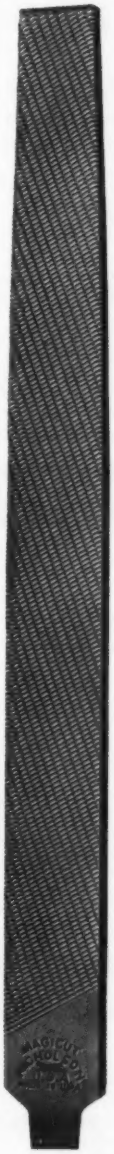
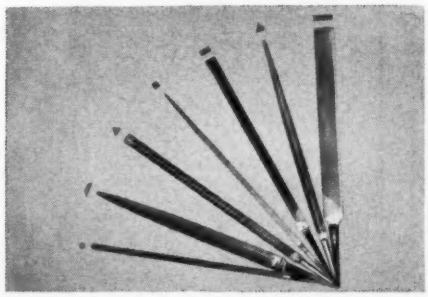
CIRCLE INFORM-A-GRAM KEY NO. 1106

We make files... and sell production efficiency





▲ X.F. Swiss Pattern files are made in every useful size and shape — from 00 to 6 degrees of coarseness.

◀ "Magicut" All-Purpose Machinist's file, created by Nicholson for superior metal filing — and proved in use to be superior.

Three strategically located Nicholson plants make files for every purpose.

When you buy our files, through your nearby industrial distributor, you actually buy increased production efficiency. That's because we design and make our files to do a bit more in every stroke and last many strokes longer.

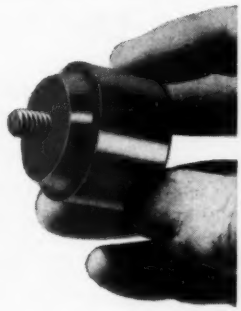
As a result, they make your skilled craftsmen even more skilled. They do more filing in less time. And that's where you really save money in filing. Because our files have a longer life, you save on tool costs.

Extra production comes in every file you get with the Nicholson, Black Diamond or X.F. Swiss Pattern trademark. So when you order, don't just ask for files. Specify Nicholson brands—and enjoy their superior productivity.

NICHOLSON INDUSTRIAL HAMMERS

now at your Distributor's

Now you can get Industrial Hammers with the trusted Nicholson trademark. Soft-Faced Deadblo, Rawhide Demountable and Rawhide Mallets are now at your Distributor's. See these non-marring hammers soon.



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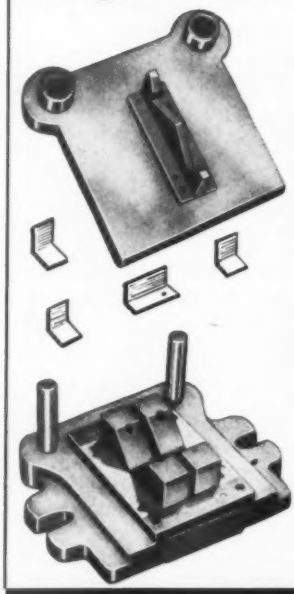
NICHOLSON and BLACK DIAMOND FILES

A FILE FOR EVERY PURPOSE

CIRCLE INFORM-A-GRAM KEY NO. 111

Punches and Dies

Angle Iron Cut Off Die



No. 18, cut off die, for 2" x 2" x ¼" and lighter angles. Mounted in leader pin die set. Fits 'most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adapters and die shoes to convert your press. Each precision-made.

26 *years of serving your punch and die requirements*

What are your punch and die needs? Consult us about your problems. Prompt service on "specials" made to your order.

SEND FOR FREE CATALOG NO. 157 AF, illustrating our standard punches and dies and complete line of modern sheet metal fabricating equipment. NET PRICES SHOWN.

WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1121

ACCURACY .0002 T.I.R.

.0002 T.I.R. or less at Spindle Nose, .0005 T.I.R. or less on Test Arbor six inches from Spindle Nose

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

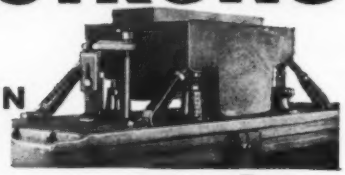
Clip ad to your letterhead and send for Literature

K. O. Lee Company, Aberdeen, S. D.

CIRCLE INFORM-A-GRAM KEY NO. 1123

ARMSTRONG

SET-UP *and* HOLD-DOWN TOOLS



ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

Write for circular

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5220 W. Armstrong Ave. • Chicago 30, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1122

FOR FASTER TOOLING, STYLING AND PATTERN MAKING

Challenge®

OFFERS YOU NEW LIGHTWEIGHT

MAGNESIUM & ALUMINUM PRECISION INSPECTION EQUIPMENT

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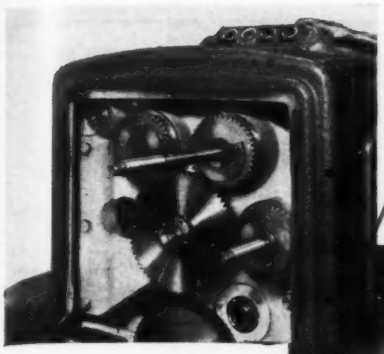
Including

- Universal Right Angle Irons
- Pattern Makers Angle Plates
- Straight Edges • Parallel Straight Edges
- Height Blocks • Tooling Angles
- Magnesium Scribers

Here's all the stability and accuracy of fine precision equipment in an extremely lightweight, portable form. 25 to 40% the weight of semi-steel units. Easy to handle . . . easy to carry . . . easy to position. Write for catalogs describing this new addition to the Challenge line or see your local Industrial Distributor for full details. TP-5

THE CHALLENGE MACHINERY CO., GRAND HAVEN, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1124



GREENLEE LEAD-SCREW FEED ASSURES *Precision* THREADING and TAPPING

PRODUCTION MACHINERY
GREENLEE

PRODUCES UNIFORM HIGH QUALITY... Reduces Scrap ... Lowers Costs!

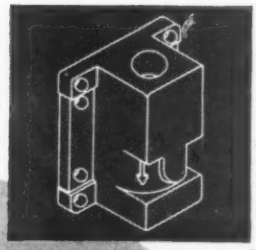
The Greenlee precision lead-screw threading arrangement makes it easy to machine parts otherwise impractical on an automatic bar machine. Precision Acme, tapered and multi-lead threads are machined in the high speed and feed ranges required. Smooth, clean thread form, fine fit and high tolerance concentricity make lead-screw threading profitable. Built-In Duplex clutches on 6-spindle machines reduce set-up time on simultaneous tapping and multi-tooled jobs. The profitable lead-screw arrangement can be applied to Greenlee machines in the field as well as on new Greenlee Automatics. It will pay you to investigate.

Want more information? Write today for Catalog A-405.

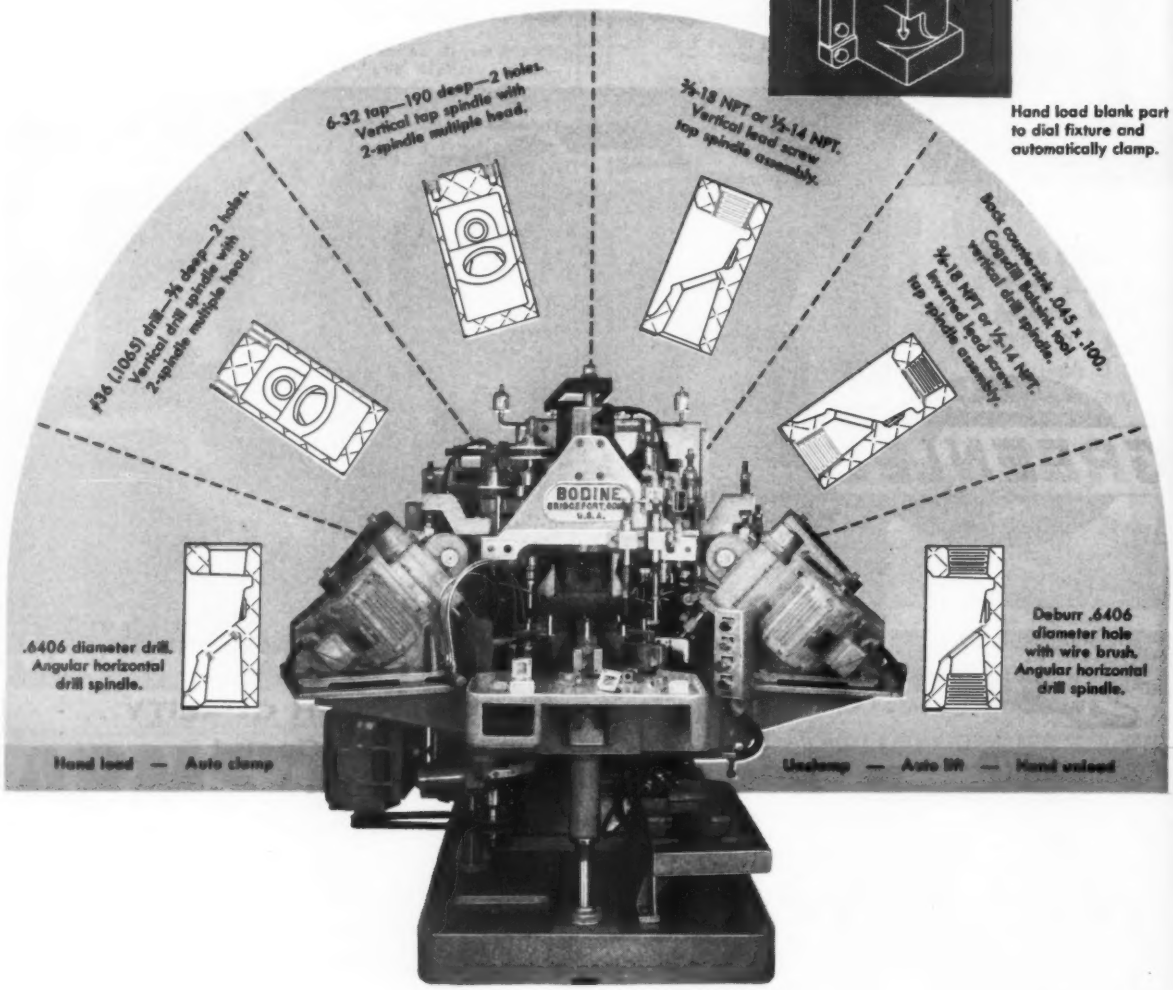
GREENLEE BROS. & CO.
2045 Mason Ave.
Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 113

Bodine case history no. 46



Hand load blank part to dial fixture and automatically clamp.


6-32 tap—190 deep—2 holes. Vertical tap spindle with 2-spindle multiple head.
⅜-18 NPT or ½-14 NPT. Vertical lead screw tap spindle assembly.
#36 (.1065) drill—⅞ deep—2 holes. Vertical drill spindle with 2-spindle multiple head.
Back countersink .045 x .100. Cogsdill Bakelok tool. Vertical drill spindle.
⅜-18 NPT or ½-14 NPT. Inverted lead screw tap spindle assembly.
.6406 diameter drill. Angular horizontal drill spindle.
Deburr .6406 diameter hole with wire brush. Angular horizontal drill spindle.
Hand load — Auto clamp
Unclamp — Auto lift — Hand unload
BODINE
BRIDGEPORT, CONN. U.S.A.

Good way to hold a winning hand

in competitive manufacturing.

This major manufacturer of automatic control equipment has used cost-reducing Bodine Basic Machines and tooling methods for many years.

The interesting new Bodine unit shown above went in to replace another machine . . . to include MORE OPERATIONS, performed at a FASTER RATE.

The new machine features recently-developed Bodine reversing motor-driven lead screw spindles . . . one vertical and one inverted. The valuable versatility of Bodine tooling with combinations of vertical, angular and inverted spindles is clearly demonstrated.

This is also an example of how advanced Bodine tooling is constantly stepping ahead of production demands, even among present Bodine users. In all cases, such tooling is readily adapted to present Bodine Basic units, an important cost-advantage users of our equipment enjoy.

If you have a part you would like to produce better at lower cost, send us a sample and prints for analysis. No cost or obligation. Write Dept. TP-5.

MATERIAL and PART: Zinc die-cast valve body.

PRODUCTION: 15 complete pieces per min.; 6000 operations per 50-min.hr.

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

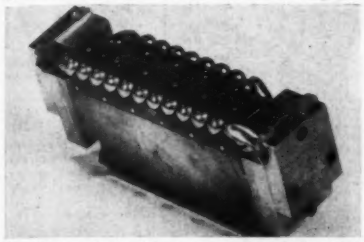
1BD88

CIRCLE INFORM-A-GRAM KEY NO. 114

PRODUCTS on PARADE

For more information about the products described here, use POSTAGE-FREE Reader Service Card in this issue.

Eliminate Breakway Friction on Horizontal Sliding Tables and other machine tool parts using the Beaver ball-way cartridges. These cartridges increase sensitivity of control and lend themselves better to pre-



loading since they are fixed in the moving part and can be shimmed and adjusted for maximum system stiffness. For information, write Beaver Precision Products, Inc., Clawson, Mich., or — **Circle No. A1.**

Simplify Milling Machine Operations and Save Time using a milling machine T-square. This precision-made tool positions toolroom and production jobs requiring a 90° angular relation to the mill spindle or

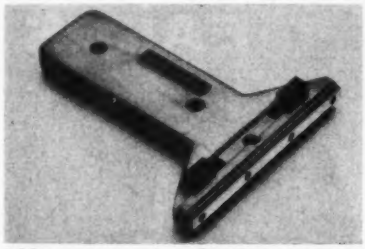
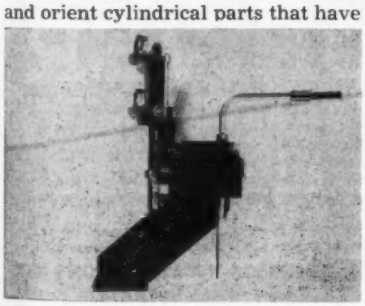


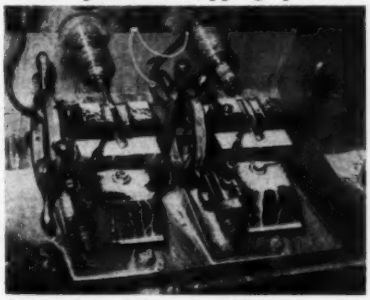
table movements. It also supports the workpiece and prevents shifting while under pressure from the cutter. For information, write to Advance Products Corp., Benton Harbor, Mich., or — **Circle No. A2.**

An Orientation Device will sort and orient cylindrical parts that have



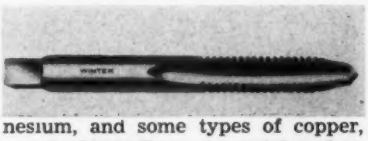
OD and ID variation at one end. It accepts the parts at random, and when part is upside down, the orientor turns the part over before letting it proceed in the feeding line. Peeco Div'n, Automation Devices, Inc., Erie, Pa., or — **Circle No. A3.**

A Horizontal Tapping Machine will tap pipe or tubular ferrous or nonferrous metal pieces too long to be handled vertically. This 2-spindle model operates at tapping speeds of



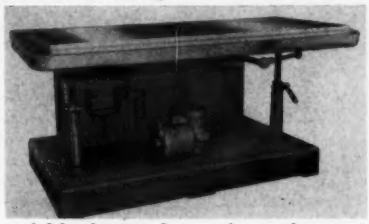
from 60 to 240 rpm and to a maximum depth of 4". CAPCO Products Div'n, P. O. Box 507, Columbus 16, Ohio, or — **Circle No. A4.**

For Tapping Blind Holes in Soft Aluminum, stainless steels, mag-

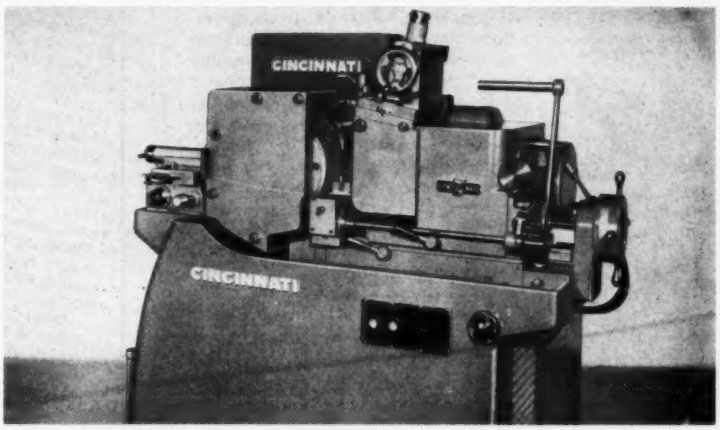


nesium, and some types of copper, use the Multi Tap. A special surface treatment increases the surface hardness which retards the abrasion and promotes longer tool life. Winter Brothers Co., Rochester, Mich., or — **Circle Inform-A-Gram No. A5.**

Save Time and Reduce Fatigue using the power elevated table built for easy up-and-down table movement. For the loading of heavy parts onto the table, the table can be

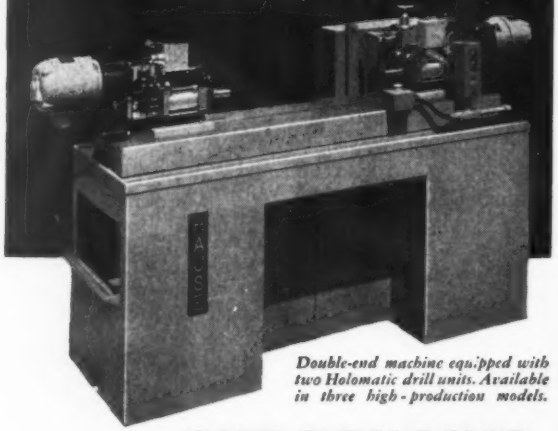


quickly lowered to where the part can be pushed into position, and in seconds returned to working position. For information, write Edlund Machinery Co., 50 Huntington St., Cortland, N. Y. **Circle No. A6.**



This Small General Purpose Centerless Grinding Machine is suitable for grinding metallic or non-metallic parts up to 1½" dia. The Cincinnati Filmatic No. 1 is recommended for the rapid, accurate production of small drills, pins, punches, shafts, and instrument parts. It features Filmatic spindle bearings, with automatic lubrication and electrical cutout protection. For information, write to Cincinnati Grinders Inc., Cincinnati 9, or — **Circle No. A7.**

Holomatic SYSTEMS



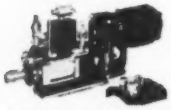
Double-end machine equipped with two Holomatic drill units. Available in three high-production models.

CUT DRILLING-TAPPING TIME

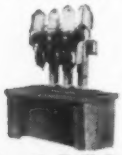
Model 24 – Holomatic Drill Unit Electric Motor Driven Spindle

Model 14 – Holomatic Drill Unit Air Motor Driven Spindle

Model 24 – Holomatic Unit For Drilling and Tapping



Model 24 – Holomatic for Deep Hole Drilling



Automatic Drill Press: Available in four base lengths with 1, 2, 3 or 4 Holomatic units vertically mounted.

● The modern high-production method for all automatic spindle type operations. Available as individual, self-contained power head units for installation on existing production machinery or as complete base-mounted machines with automatic controls.

Holomatic units operate on shop air line pressures for thrust and feature a self-contained hydraulic system for positive, accurate spindle travel and feed regulation. Traverse and feed rates are infinitely adjustable. Automatic, manual cycling, skip drilling, stops or dwell operations are easily arranged. Built-in air control valve simplifies set-ups and cuts installation time. Holomatic units operate efficiently at *any* angle.

Amazingly versatile, accurate, the Holomatic systems can be quickly and easily set-up for single or multiple operations. A Holomatic system in your plant will quickly and easily pay for itself through savings in time, money and tools.

Survey your production equipment now and visualize how easily and economically a Holomatic unit or complete system could boost your production rates.

Write today for complete information, specifications and prices ... or, ask your Hause representative for an actual, obligation-free demonstration of the Holomatic System right in your plant!

Hause

MACHINES, INC.
MONTPELIER, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1161

THIS VAST IMPROVEMENT OVER CONVENTIONAL HEIGHT GAGES OFFERS A NEW CONCEPT IN THE MAKING OF ACCURATE MEASUREMENTS

The radically NEW OPTIC VERNIER HEIGHT GAGE

TUMICO

Saves Time and Labor!

RAPID QUICK ADJUSTMENT

Scriber clamp permits firm clamping above and below jaw

SIZES AVAILABLE
18" 24" 36" 48"
60" 72" 84"

ASK FOR AND COMPARE OUR MODERATE PRICES!

If not available at your favorite Supply House — Write to us for Illustrated Folder Code GIULB

ELIMINATES PARALLAX avoiding all optical reading errors

UPRIGHT COLUMN **H** BEAM DESIGN for SUPERIOR STRENGTH and RIGIDITY PREVENTING SWAY and VIBRATION

READING ACCURATELY with NAKED EYE from SCALE and VERNIER from REAR of GAGE

EASY READING 2-1/2" LONG VERNIER
Solves problems of reading fractions of 1/1000" quickly and accurately

FINE ADJUSTMENT thru screw on base

ADDITIONAL FINE ADJUSTMENT ON TOP OF BEAM ON LARGER GAGES

LARGE SOLID BASE

GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS

200-T LAFAYETTE STREET • NEW YORK 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1162

USED BY INDUSTRIAL LEADERS

LUFKIN FOUNDRY
GENERAL ELECTRIC
JOHNSON MOTORS
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NEW PROCESS GEAR
DANA MONARCH
GOULD PUMP

SENECA FALLS Automatic

WORK DRIVER

DRIVES ANYTHING BETWEEN CENTERS

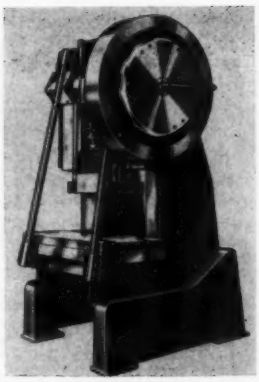
NEW JAWS with angular serrations . . .
SELF-ADJUSTING to work eccentricity . . .
PREVENTS strain on head center . . .
SAFER—no projecting parts to injure operator . .
FASTER—saves time, one operator can attend several machines. Models for all machines. Sizes for ¼" to 67⅞" work diameter; Priced from $81. Write for Bulletin D-57 for complete information.

SENECA FALLS MACHINE

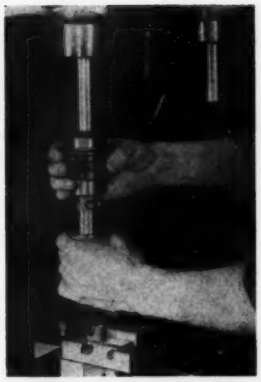
BETTER TOOLING SINCE 1864 **SENECA FALLS MACHINE CO.**
Seneca Falls, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1163

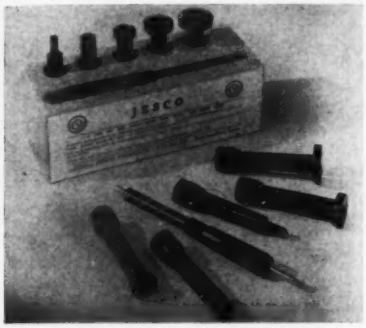
A 60-Ton Welded Steel Frame Type Press offers a 4" stroke operating at 150 spm. It features a low inertia pneumatic clutch; and a slide, made with a detachable head, facilitates changes from standard to flanged slide face without refitting the slide ways. Emhart Mfg. Co., V & O Press Div'n, Hudson, N. Y., or — **Circle No. A8.**



Xtra-Safe, Modern-Magic Chucks and Collets feature extra-wide, flange-topped locking rings for hand protection. The collets also have a smoothly flared, wide flange which keeps greasy hands from riding up into the chuck and insures against dropping them. Jones & Lamson Machine Co., Springfield, Vt., or — **Circle No. A12.**



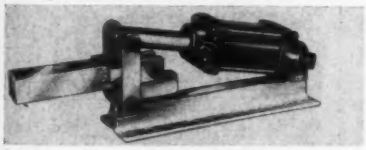
A Precision Transfer Punch and Drill Jig Set is fast, simple to use, and accurate. The Jesco set replaces over 900 single decimal and fractional size punches and is used for transferring location of threaded,



drilled, and reamed holes. For information, write Middlesex Engineering & Mfg. Co., Inc., P. O. Box 358, 119A Silas Deane Hwy., Rocky Hill, Conn., or — **Circle No. A9.**

Supply Pre-Mixed Coolant to any number of machines from a single supply source with the Mistic Mist centralized cooling systems. Using the principle of gravity feed, the injector valve on the water supply line permits supply tank refill from floor level. Individual control valves are mounted on each machine, and the system can be expanded when needed. Aetna Mfg. Co., Bensenville, Ill., or — **Circle No. A10.**

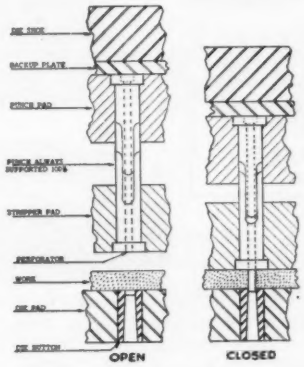
Heavy-Duty, Air-Operated Clamps have been added to the Knu-Vise product line. The 800-lb capacity clamp comes in three models. One



is for conventional holding operations; another for difficult mounting situations, as when the cylinder interferes with conventional clamping. For more information, write Lapeer Mfg. Co., Lapeer, Mich., or — **A11.**

Because . . .

WHEN PUNCHING IT IS 100% SUPPORTED BY A TELESCOPING SUPPORT-SLEEVE



Typical Installation

A Durable Perforator stays "alive" longer, because it is supported 100% the full stroke of its Telescoping Sleeve.

You get positive alignment, closer tolerances, burr free holes, regardless of the types of metal used. Holes are punched faster, easier and accurately.

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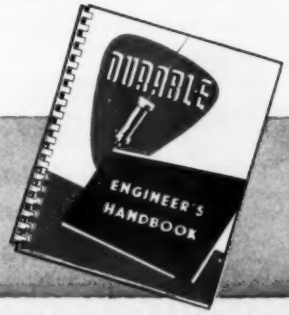
121 pages showing 100 Practical Die Designs. NO CHARGE, NO OBLIGATION



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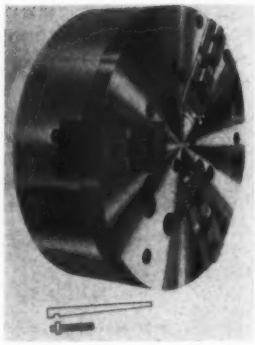
DURABLE PUNCH & DIE COMPANY

9030 South Hermitage St., Chicago 20, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 117

A Precision High Speed Power Chuck has tapered gibs to take up jaw and keyway wear. It was designed for the higher spindle speeds needed to take full advantage of high speed cutting tools, but it can also be used on an automatic. Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich., or — **Circle No. A13.**



Large Diameter Work is handled with a special purpose vertical boring, facing, and turning machine. It features 72" swing capacity and push-button control of major machine functions. Precision horizontal and vertical settings are made without handwheel. Frauenthal Div'n, The Kaydon Engineering Corp., Muskegon, Mich, or — **Circle No. A14.**

ARE YOU USING- HOVIS UNIVERSAL Master COMPOUND DIES

to Produce WASHERS and SMALL STAMPINGS from all Types of Materials the ECONOMICAL WAY?

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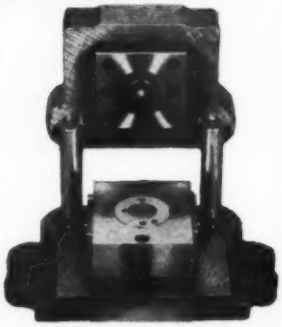
NO NEED TO MAKE A NEW DIE FOR EVERY STAMPED PART

● By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.



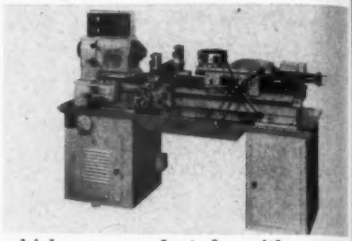
Made in 5 sizes:
¾" - 1½" - 2½" - 4" - 6"

Specialists in designing and manufacturing MULTI-DIES as well as supplying COMPLETE TOOLING FOR ALL SIZES OF NUT FORMERS

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD • BOX G • WARREN, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit
CIRCLE INFORM-A-GRAM KEY NO. 118

An Automated Turret Lathe with 14" swing and 1⅝" spindle hole is the first of a series of automated turret lathes used for efficient short or long production runs. The machine has rapid-travel feed cycle variations



which are selected with setup switches, the infeed limit position which is adjustable for each turret station, and pushbutton two-speed reversing motor starter. Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, or — **Circle Inform-A-Gram No. A15.**

A Throwaway Insert Type Toolholder with variable geometry permits changing of rake and relief angles without removal of the toolholder. The Varirake will also reduce tool holder inventory for job-lot shops with numerous job requirements. United Tool Co., 303 U. B. Bldg., Huntington, Ind., or — **Circle Inform-A-Gram No. A16.**

An Air-Operated Automatic Heavy-Duty Clamp is said to deliver ten times the line pressure and is cam-locked to hold the clamp locked in event of air failure. The air

cylinder is located under the clamp for compactness. The device is 3" wide, 3⅝" high, and 8¼" long. For literature, write to Lodding, Inc., Worcester, Mass., or — **No. A17.**

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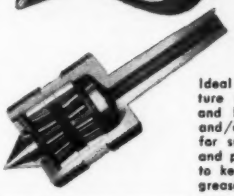
LIVE CENTERS

GUARANTEED TO MATCH OR EXCEED, "CRITICAL" JOB SPECIFICATIONS

In the GOLD BAND line Ideal has combined the latest production methods with their traditionally fine craftsmanship to bring you an unequalled standard of excellence in live centers. Accurate, (to ± .0001") GOLD BAND Live Centers offer "custom" quality at production prices. Specify GOLD BAND Live Centers and your every need can be accommodated from stock . . . 99 times out of 100. Ideal's GOLD BAND Live Centers offer savings, simplified operations and higher lathe output both in quantity and quality. Contact your distributor today...or



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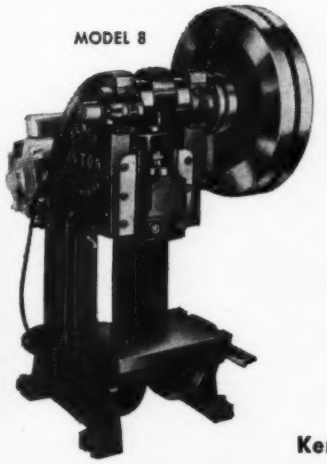
CIRCLE INFORM-A-GRAM KEY NO. 1191

KENCO 8-TON PRECISION-BUILT PUNCH PRESSES

MODEL 8



. . . rugged, fast and trouble-free

They're Kenco-built with long-wearing parts *throughout* to eliminate downtime and give you *many extra* years of steady, low-cost production. Rigid, multiple-rib frames and extremely long ram ways assure high precision production. Driving mechanism engineered for trouble-free operation. Press is competitively priced.

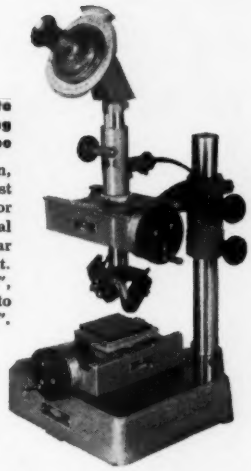
Model 8-R—8-ton deep-throat, Rigid-Rib

Same construction features, but with 12¾" throat, and tremendous resistance to breakage, deflection, or torsional twist.

Kenco presses—14 models—2 to 15 tons
Write for literature

KENCO MANUFACTURING CO.
5211 Telegraph Road, Los Angeles 22, California

CIRCLE INFORM-A-GRAM KEY NO. 1192



Coordinate Measuring Microscope
High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".

Cut rejects, speed production

Fast, reliable readings to 0.0001" with Gaertner measuring microscopes

Precise, versatile, easy-to-use Gaertner measuring microscopes assure positive, direct measurement of precision parts. You see clear, sharply-defined images. No physical contact to distort or injure object being measured. Enjoy new production savings with Gaertner optical instrumentation. Write for complete data on the Gaertner line of industrial microscopes.

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Ultimate in measuring microscopes. Range 2" x 4", reading to 0.0001", angular measurement to 1 minute.

Micrometer Slide Comparator
Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

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High quality, low cost instrument for extremely precise measurements. Range 0.08", reading to 0.00002".

Write for Bulletin 161-54 showing applications, models, specifications.

The Gaertner Scientific Corporation
1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 1193

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JIG GROUND with

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VULCANAIRE AND BRIDGEPORT MILLING MACHINE

Any Vertical Milling Machine can be used for jig grinding. These machines with micrometer standards can be used for jig grinding to close tolerances. Low cost jig grinding is possible with the Vulcanaire.*

*Provide yourself with this inexpensive instrument for use on your present equipment and JIG GRIND with a guarantee!

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CIRCLE INFORM-A-GRAM KEY NO. 1201

LOTS OF HOLES... FAST?

For 2, 3 or 4 spindle drilling you can do it better, faster, at lower cost with U. S. Standard Adjustable Heads.

More reserve stamina built in . . . antifriction bearings . . . high alloy steel spindles and shafts . . . heat treated and shaved gears . . . more than ample spindle bearing . . . parts run in oil (oil-mist for speeds around 4000 rpm).

Standard Adjustable 3-spindle head, all spindles adjustable. Five styles—2 to 4 spindles, up to 1⅜" drill sizes, up to 15" bolt circles.

Write for catalog AD-57

US DRILL HEAD — Adjustable and Fixed Center Multiple Drilling Heads. Individual Lead Screw Multiple Tapping Heads.

UNITED STATES DRILL HEAD CO.
BURNS STREET • CINCINNATI 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1202

The Quick, Easy, Handy Way to TAP BY HAND

. . . Adapts for LATHE USE

THE DAHLSTROM TAP GUIDE virtually eliminates tap breakage—and saves those costly hours spent prying broken taps out of dies. Anyone can use it. Just a few turns of the spindle and the job is done.

Winds through continuously, with no backoff. Work is always dependably straight and square. Fasten it to a post or set it on top of a big job. This handy tapper comes equipped with 9 adapters, 8-32 to ¾" but taps are not furnished. Spindle can be pulled out and used in a lathe, or used as tap extension for hard-to-get-at-places. 13" x 8" x 14", wt. 32 lbs.

Also Makers of Dahlstrom Autostrop and Tap Chuck
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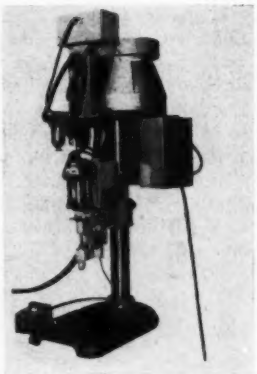
BRANCH MFG. CO.
16 Olson Drive
NORTH BRANCH, MINN.

Dahlstrom **TAP GUIDE** — **$59.50 F.O.B. Factory**

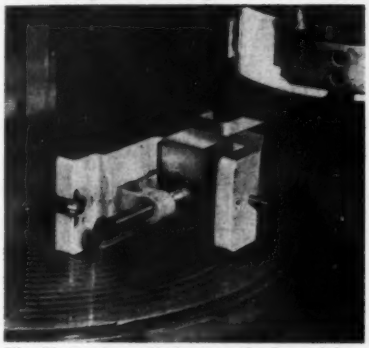
CIRCLE INFORM-A-GRAM KEY NO. 1203

Speed Production by placing Dodge expansion inserts into drilled or molded holes and anchoring the inserts at the same time using a threaded insert assembly machine. It can be tooled to place and expand from one to six inserts. The Phelps Mfg. Co., P. O. Box 542, Westport, Conn., or — **Circle No. A18.**



Light, Tough, and Abrasion Resistant are properties of the nylon-plastic material which is used in toggle shoe clamps. The material, a good insulator, is also resistant to oils, greases, solvents, and most chemicals. Because it is resilient, it is not necessary to use a wrench for extra tightening. Northwestern Tools, Inc., 116 Hollier Ave., Dayton 3, or — **Circle No. A21.**

Hold Small and Medium Workpieces for precision squaring operations using the Multi-Square small parts fixture. It is used for grinding or milling all sides square on a block.



No distortion of the vertical position of the leg is possible, because the work is held by a clamp pivoted at the rear of the leg. Manchester Machine Tool Co., Dept. MM, 5142 Manchester Rd., Akron 19, Ohio, or — **Circle Inform-A-Gram No. A19.**

A Lathe Indicator Stop holds tolrances closer than ±0.001 on ordinary engine lathes. Sure Stop has five easily adjustable stop rods which

index accurately to allow a wide range of machining possibilities. DSC Machine Co., Inc., 21 Bertel Ave., Mt. Vernon, N. Y., or — **Circle Inform-A-Gram No. A20.**

58-20

Here's Why Continental Counterbore Drives

Never Bind! Never Fail!

Continental Counterbores operate precision-smooth and detach with a *twist of the wrist* because the driving forces generate *compressing* not *shearing action* in the holder. They *never* bind, deliver long-lasting, trouble-free operation.

In Continental Counterbores, you get extra torsional rigidity because drive lugs are close to the seating shoulder of the cutter. Double lugs on the cutter engage double abutments in the holder to form a powerful tool. But best testimony to the satisfaction you get from these counterbores is this: *no one has ever reported failure of a Continental Counterbore Drive!* For more information, call your local Ex-Cell-O Representative or write to Continental Tool Works in Detroit. Available individually or in a choice of three sets.

Continental

TOOL WORKS

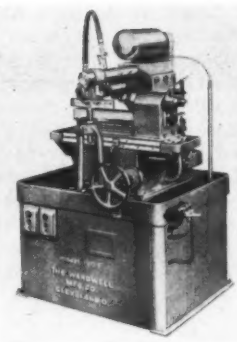
Division of CTW

EX-CELL-O CORPORATION

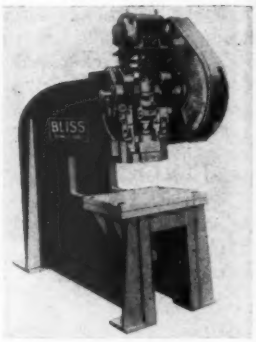
DETROIT 32, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 121

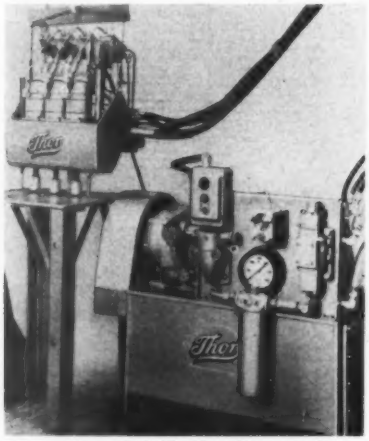
A Versatile, Automatic Saw Tooth Milling and Grinding Machine grinds saws; mills form milling cutters, slitting and screw slotting saws, and straight flutes in tools, taps, and reamers; and mills or grinds other special dividing headwork. The Wardell Mfg. Co., 2805 Ridge Rd., Cleveland 9, or — **Circle No. A22.**



High Speed Punching, Cutting, and Forming on large wide sheets can be done with a line of deep throat presses. They have capacities from 22 to 60 tons, single geared or not geared, and are offered with adjustable stroke range. Throat depth varies from 12" to 34". E. W. Bliss Co., Canton, Ohio, or — **Circle No. A26.**



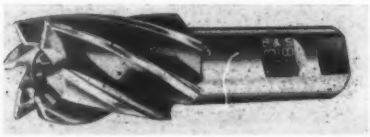
A Completely Hydraulic Control System is designed for multiple nut-setting and other multiple power tool operations in industrial assembly. Thor-Draulic delivers uniform



torque to ±1 ft-lb simultaneously to as many threaded fasteners as it is set up to drive. For information, write Thor Power Tool Co., Prudential Plaza, Chicago 1, or — **No. A23.**

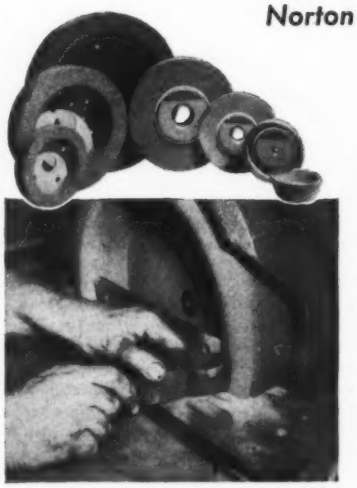
Wear Plates, designed for use wherever there is sliding contact between flat metal parts, are made of steel and electroplated with a bronze bearing surface. Long wear and ready machinability are advantages of these plates. For information, write Lamina Dies & Tools, Inc., Royal Oak, Mich., or — **No. A24.**

79 Square End, End Mills have been added to the milling cutter line of the Cutting Tool Div'n, Brown & Sharpe Mfg. Co., Providence 1. Ranging in size from ¼" dia through 2", these end mills are available in single-end, double-end, long single-end, and extra long single-end. Get more information from the company, or—**Circle Inform-A-Gram No. A25.**



Fishing for

Norton K† Bond CRYSTOLON* Wheels Bring Big Advantages to Offhand Grinding

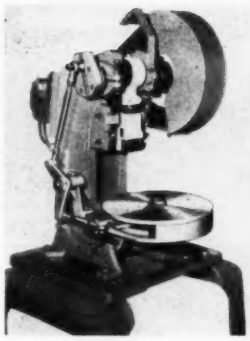


Here's a combination of vitrified bond and silicon carbide abrasive that delivers remarkable results — particularly in offhand sharpening of single-point carbide tools. Wheels are made in dense, medium, or porous structure — for most efficient action regardless of the area of contact.

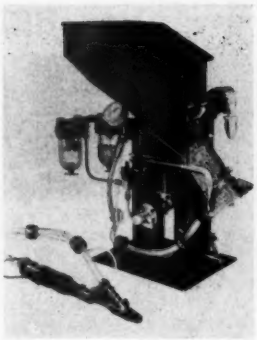
Also, CRYSTOLON abrasive is available in green or gray types — green, 39C, being first choice in a majority of carbide applications. And the Norton K Bond is one of the most radically improved vitrified bonds ever developed. One big advantage is: *it assures closest possible duplication of wheel specifications.* Which means that every time you reorder K Bond wheels you get exactly the same top performance.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries
†Patent applied for

A Dial Index Feed features an indexing motion at press speeds as high as 280 spm as well as increased shut height on the press. The feed is equipped with a choice of 12" or 15" table diameters and has provision for either 10 or 12 stations. Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif., or — **Circle No. A27.**



The Jet-Setter has a tapered plastic-covered head for automated driving of threaded fasteners in confined locations. It can be used at any angle to drive all types of standard screws, and prevents marring of highly finished surfaces. Parker-Kalon Div'n, General Transportation Corp., Clifton, N. J. **Circle No. A28.**

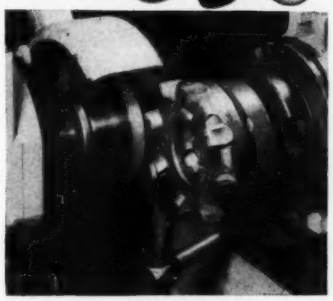


carbide grinding economies?

Catch 'em all fast— with the finest lures made

You cut grinding costs to rock bottom with Norton's outstanding wheel selection and service

Norton Diamond Wheels, Mined or Man-Made
...Carbide Grinding's
Certified Crown Jewels



Norton was first to introduce all three bond types of diamond wheels: resinoid, vitrified and metal . . . does all its own checking and sizing of diamonds . . . duplicates wheel specifications with constant accuracy.

The three Norton bonds — resinoid, vitrified and metal — cover the complete range of carbide grinding requirements — from roughing to precision — including sharpening, surfacing and cutting off — on all kinds of work: single-point tools, multi-tooth cutters, form tools, dies, blanks, etc. Resinoid wheels are available in special bond types — B for wet and B6 for dry grinding.

Norton leadership in diamond wheel manufacture continues whether the diamonds used are natural or man-made. And with each Norton diamond wheel you get a certificate of diamond concentration, bearing the signature of the President of this Company.

W-1844

The Complete Line, Completely Serviced

See your Norton Abrasive Engineer or Distributor for expert advice and prompt deliveries on the wheels you need for top quality, lowest cost carbide grinding. Or write to NORTON COMPANY, General Offices, Worcester 6, Massachusetts.

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NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals
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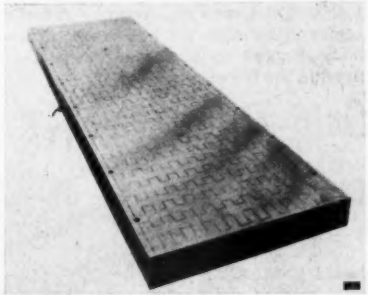
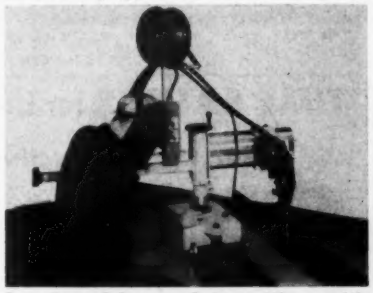
CIRCLE INFORM-A-GRAM KEY NO. 123

Reduce Set-Up Time using the H Type electromagnetic chucks designed to accommodate the present day feeds and speeds. They are available in rectangular sizes up to



36" x 120", and can be used in tandem arrangements to make even larger installations. For information, write to O. S. Walker Co., Inc., Worcester 6, Mass., or — **No. A29.**

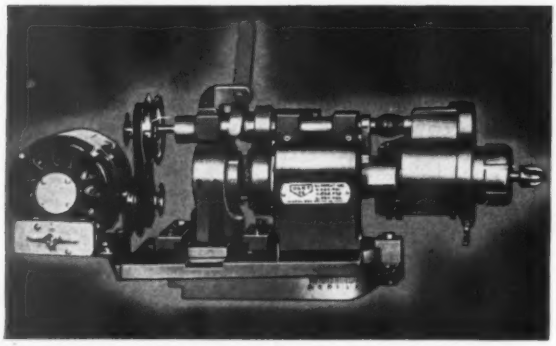
Automatic Welding, Cutting, and Heat Treating can be done with a portable, electric motor-driven, track-guided machine. The Beetle can be equipped to do straight-line,



bevel, and heavy-duty cutting, with accessories; flame-hardening; flame-softening; and stress-relieving. NCG Div'n, National Cylinder Gas Co., 840 N. Michigan Ave., Chicago 11, or **Circle Inform-A-Gram No. A30.**

Precision Radius Tools for 9" to 13" bench, floor, and engine lathes have been announced by C. B. Teeter, 4470 Oakenwald Ave., Chicago 15. The shank and body is a one piece steel casting fully enclosing bearings and gears, thus keeping out chips and grit. **Circle No. A31.**

Precision CIRCULARITY GRINDING ATTACHMENT



Simple, speedy set-ups on this accurate attachment permit fast and easy grinding of form relief, a combination of form and radial relief, tapered cylindrical and straight cylindrical.

Model 500 Circularity Grinding Attachment is faster—easier to handle—has positive control—greater adaptability—rugged construction—is engineered and built to provide the finest precision work.

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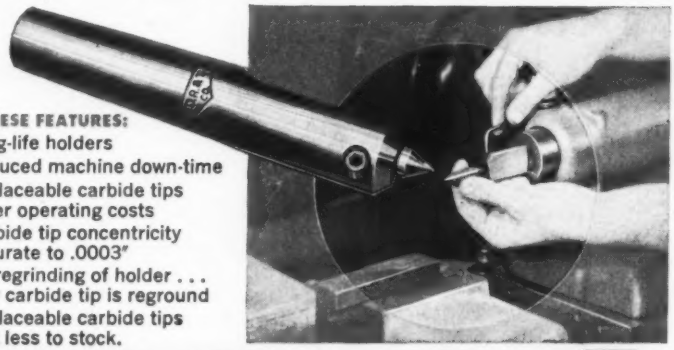

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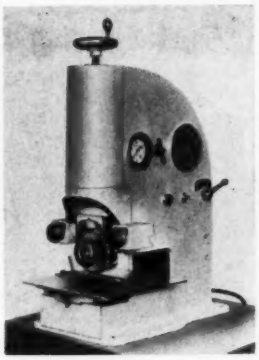
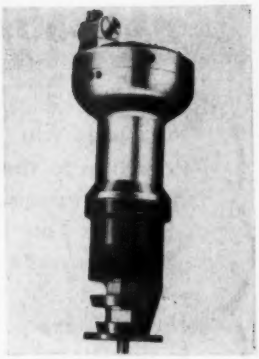
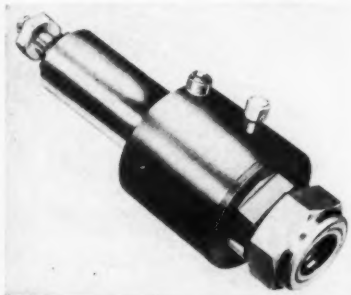


For Portable Routing Operations in non-ferrous metals and laminated materials, use a heavy-duty router. With the pushbutton selection of power drive on the W-222, finger tip control is possible in normal holding position. Onsrud Machine Works, Inc., Portable Tool Div'n, 3941 Palmer St., Chicago 47, or — **Circle No. A35.**

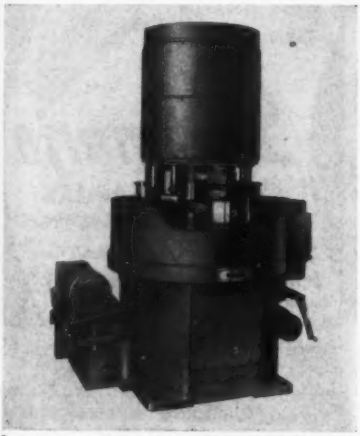


New Deep Hole Drilling Tools are used on multiple spindle machines to handle many deep hole drilling jobs. Available in four different models, the tool has an oscillating action which breaks the chips into



fine granules, eliminating the chip problem and affording longer drill life. Finer finishes, closer tolerances, and better concentricity are maintained. Boyar-Schultz Corp., 2000 S. 25th Ave., Broadview, Ill., or — **Circle Inform-A-Gram No. A33.**

A Vertical Continuous Lathe is said to equal four high speed precision lathes and can be tooled for economical production of many jobs usually done on special equipment. This



latne has four spindles which perform the same operations and are continuously in operation. The Baird Machine Co., Stratford, Conn., or—**Circle Inform-A-Gram No. A34.**

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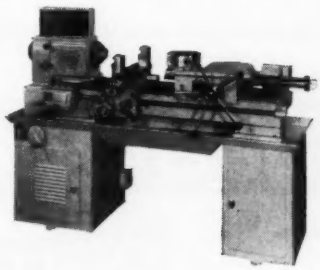

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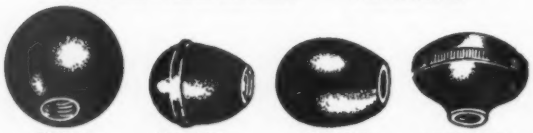

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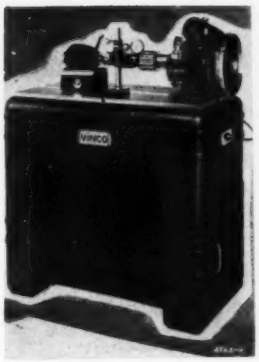

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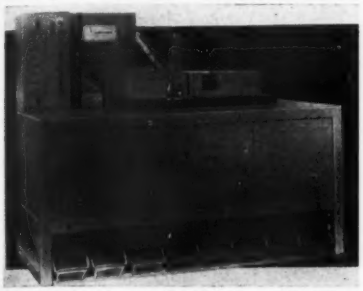
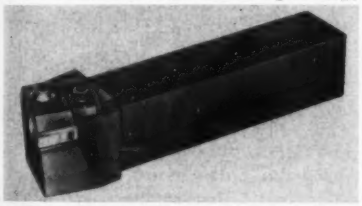


factured by Garrison Machine Works, Inc., 515-525 Bannock St., Dayton 4, Ohio. Gaging limits are easily and accurately changed, as is production speed. For information, write to the company, or — **No. A37.**

Throw-Away Insert Tool Holders eliminate the separate chip control block or chipbreaker. This line features a carbide hard faced top clamp,



and combines chip control and insert clamping, yet provides an adjustable chipbreaker. The Viking Tool Co., 1000 Nichols Rd., P. O. Box 471, Shelton, Conn., or — **No. A38.**

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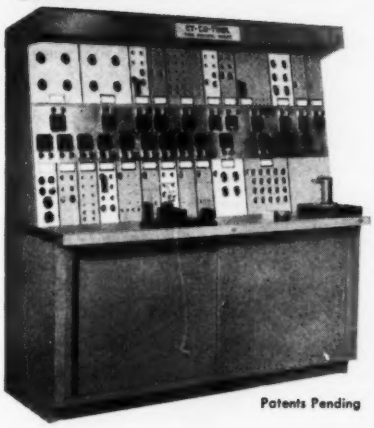

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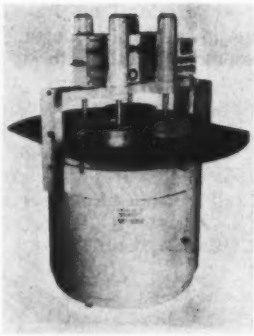
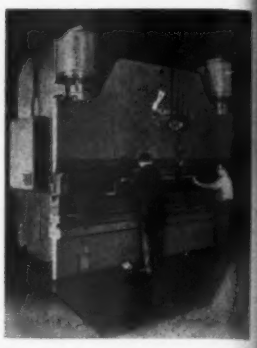


Get Extra Rigidity and Continued Accuracy under all load conditions with these hydraulic press brakes. The machines, available in 300- to 2,000-ton capacities, have a hard ram insert and sectional ram clamp for efficient use of all lengths of dies. Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, or — **Circle No. A42.**



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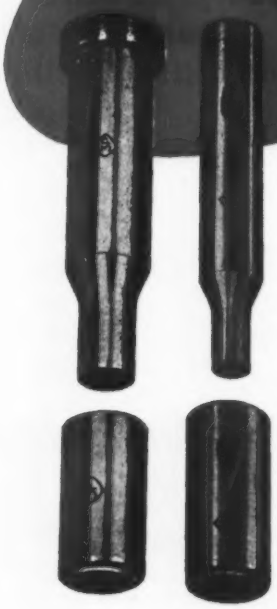

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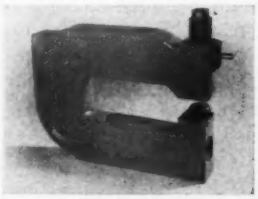
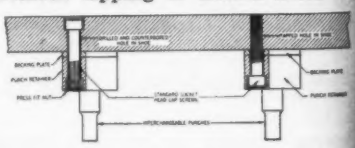
Self-Aligned and Self-Contained Punching Units for use in punch presses and press brakes are now available in the LP series. They are



capable of piercing from 0.093" to 0.625" dia holes in up to ⅛" thick mild steel. For information, write Toolset, Inc., 1417 Military Rd., Buffalo 17, or — **Circle No. A44.**

Speed Assembly Operations, eliminate thread tapping, and provide required holding strength with press fit nuts. When fastening die details, without tapping or drilled holes in



shoes, these nuts reduce mounting time. For information, write to Richard Brothers Punch Div'n, Allied Products Corp., 26500 Capitol Ave., Detroit 39, or — **Circle No. A45.**

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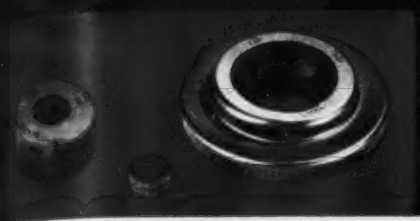

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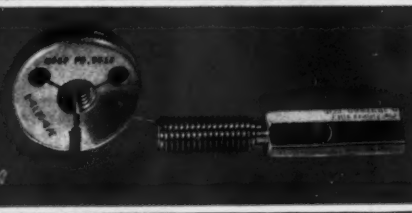

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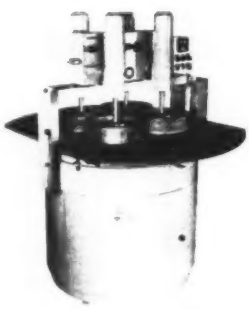
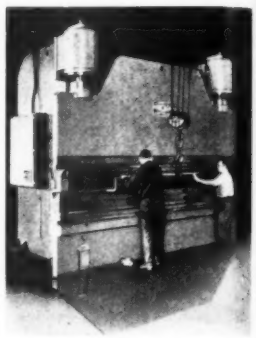
Low Cost, High Production Grinding combined with lapping quality in final results, is claimed for the Speedlap Model 32 lap grinding machine. Parts are ready for the Speedlap as cast, sintered, stamped, or turned. The Abrading Systems Co., 8020 N. Monticello Ave., Skokie, Ill., or — **Circle No. A41.**

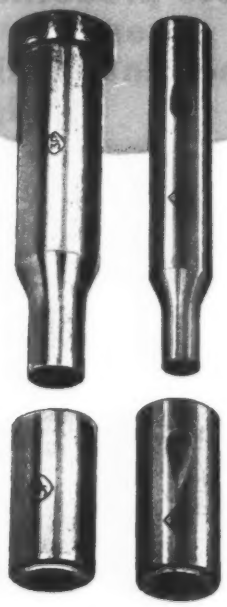


Get Extra Rigidity and Continued Accuracy under all load conditions with these hydraulic press brakes. The machines, available in 300- to 2,000-ton capacities, have a hard ram insert and sectional ram clamp for efficient use of all lengths of dies. Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, or — **Circle No. A42.**



If your feeling the PINCH...

For want of a PUNCH...



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It's a fast service company, staffed with personnel who know that "DOWN-TIME" is "LOST-TIME". Distributors in principle cities assure IMMEDIATE DELIVERY from over 37,000 sizes in stock.

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Porter Precision Products also make BAL-LOK* Punches and Die Buttons. They're always in stock and ready for IMMEDIATE DELIVERY too. Any DECIMAL size.

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HIGH QUALITY, OR ODD SIZES.

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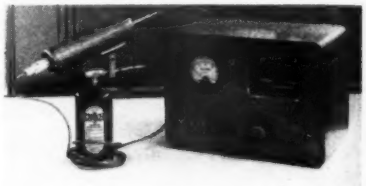
Solder Without Flux, aluminum and magnesium and their alloys with the Glennite ultrasonic soldering iron. It is used where it is necessary to avoid the corrosive effect of flux. Higher soldering temperatures are

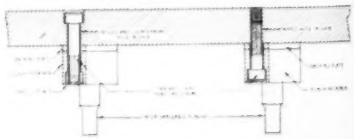


permitted because of the minimum loss in transmitting heat from the transducer to the solder tip. Gulton Industries, Inc., 212 Durham Ave., Metuchen, N. J., or — **Circle No. A43.**

Self-Aligned and Self-Contained Punching Units for use in punch presses and press brakes are now available in the LP series. They are

capable of piercing from 0.093" to 0.625" dia holes in up to ⅛" thick mild steel. For information, write Toolset, Inc., 1417 Military Rd., Buffalo 17, or — **Circle No. A44.**

Speed Assembly Operations, eliminate thread tapping, and provide required holding strength with press fit nuts. When fastening die details, without tapping or drilled holes in



shoes, these nuts reduce mounting time. For information, write to Richard Brothers Punch Div'n, Allied Products Corp., 26500 Capitol Ave., Detroit 39, or — **Circle No. A45.**

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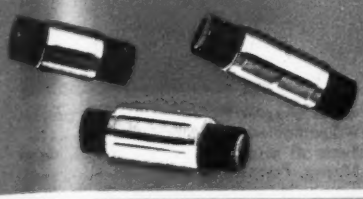
PLAIN RINGS
A G D——Hardened throughout and stabilized. Steel — Chrome—Carbide.

REVERSIBLE PLAIN AND THREAD PLUGS
For extra gage wear-life. Steel — Chrome — Carbide Lapped finishes.



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A G D——Styles 1 2 - 3 — Specials. Steel — Chrome.

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Made to A G D specifications. Steel — Chrome — Carbide — Lapped finishes.

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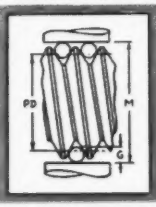
Tolerance to Millionths with ease.

TRILOCK PLAIN PLUGS
Hardened throughout — Steel — Chrome — Carbide. Range—.750" and larger.



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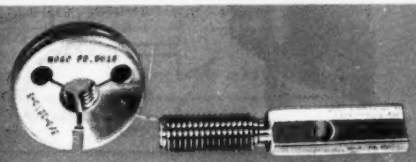

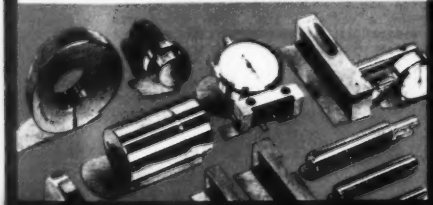

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are now available in 2 flute 3/64", 5/64", 7/64", 9/64" and 11/64" sizes from local stocks. Those former "SPECIAL" sizes are now "STOCK SIZES" offering the advantages of stock prices, deliveries.

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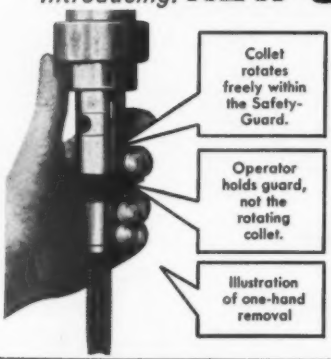
CIRCLE INFORM-A-GRAM KEY NO. 1301

Save now by replacing your old arbors and quick-change chucks under the new Scully-Jones "Tool Modernization Plan"

Introducing: **NEW Safety-Guard Collet**


Collet rotates freely within the Safety-Guard.
Operator holds guard, not the rotating collet.
Illustration of one-hand removal

To prevent accidents and breakage on radial drills and drill presses. Now, you don't have to handle rotating collets when changing tools on single-spindle machines. The new Safety-Guard acts as a "free-running bearing" between the operator's hand and the collet. The flared lip prevents heavy tools from slipping and reduces the danger of breaking cutting tools.

Answers critical need at high spindle speed. A heavy cutting tool requires a firm grip when inserting a collet in a chuck. At high spindle speeds, the collet is hard to handle. But, with Safety-Guard, the operator just inserts the collet and lets it pick up torque quickly, but gradually. The drive balls seat themselves easily and surely.

NEW Blue-Band Milling Arbor,

With more strength per inch, more accuracy for the money! Here are the latest improvements in arbors from Scully-Jones!

Larger end bearing and oversized end collar eliminate "cocking" and guard against cutter runout. Accurate setups mean each cutting tooth takes its share of the load, prolonging tool life and improving finish. Larger fillet between arbor shoulder and shaft strengthens arbor at the stress point—increases rigidity for heavier cuts.

LIMITED TIME OFFER
Ask your Scully-Jones representative about the "TM" Plan for replacement of obsolete chucks, collets, and arbors at a saving.

Blue-Band means blue chips—Get longer cutter life, and most of all, maximum running time on your milling machines, by equipping your plant with Blue-Band arbors—they cost no more.

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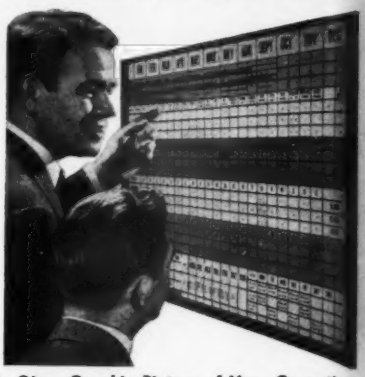

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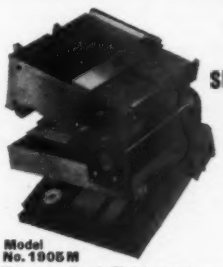

COMPOUND AND SINGLE ANGLE

New Dual Field permanent Magnetic chucks with extra holding power. Positive lock on each axis.

Model No. 1905M

The new Dual Field permanent magnetic chucks, with a center T slot, allow either side to be magnetized independently. All models are accurate to .0002" in dimensions and parallelism. A .2000" recess is provided for small angles.

Write for catalogue and prices on full line of Bald Eagle Sine Bars and Plates.

For quality—Specify Bald Eagle

Bald Eagle Corp.
(Formerly Bald Eagle Tool Co.)
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CIRCLE INFORM-A-GRAM KEY NO. 1304

CAMS ALL TYPES MADE TO YOUR SPECS

Dr. Chas. Eisler ME, Founder
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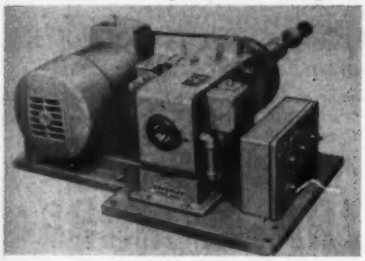
EISLER ENGINEERING CO., INC.

CIRCLE INFORM-A-GRAM KEY NO. 1305

An Electronic Compensator, which automatically adjusts for temperature or any other slow change of working conditions, is a feature of the electro-mechanical overload de-

tector for power presses. The Mark III electronically trips the power clutch control which shuts down the machine when misfeeding, buckling, or end of material, occurs. For information, write Wintriss, Inc., 20 Vandam St., New York 13, or — **A46.**

A Close Tolerance Boring Machine makes it possible to put precision boring right into production assembly. The Model S-7 Hydro-Borer with 1¾" dia spindle is designed

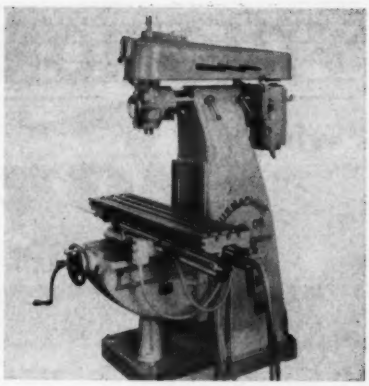


specifically for mounting on jigs, fixtures, and multiple station machines for the precision boring of large assemblies. Greenlee Bros. & Co., Rockford, Ill., or — **Circle No. A47.**

Boring Bars and Forged Bits are manufactured from high quality tool steels and solid high speed steel, respectively. The bars, available with

four flats and straight or angular square holes, range from ½" to 1½" dia. The forged bits come in ⅜" to 1" dia shanks with ¼" minimum boring capacity. Maxwell Industries, Inc., 493 E. 5th St., Ashtabula, Ohio, or—**Circle Inform-A-Gram No. A48.**

A Vertical Milling Machine is now available with air-hydraulic table feed for semi-automatic production use. The equipment provides rapid traverse approach, controlled cutting feed and distance, and automatic rapid retraction. A range of 24 different spindle speeds from 65 to 2850 rpm is offered. U. S. Burke Machine Tool Div'n, Brotherton Rd. at Pennsylvania R.R., Cincinnati 27, or — **Circle Inform-A-Gram No. A49.**



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NEW *Convenience*
NEW *Capacities*
NEW *Designs*

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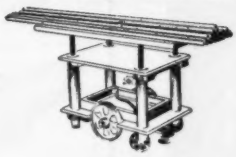
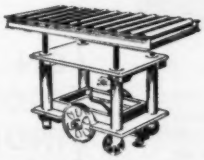
The Handy HAMILTON Portable, Elevating Table





NEW provision for increasing table area!

NEW provision for raising and lowering overhanging loads!

NEW convenience in maneuvering! Six wheel models roll easier . . . turn shorter.

NEW overhanging conveyor tops!

More stamina, more versatile performance than ever before

NEW FREE LITERATURE illustrates and describes all! Write for Bulletin P-5603. Address, The Hamilton Tool Company, 832 South Ninth Street, Hamilton, Ohio.

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FRICTION SAWING with Tannewitz

HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

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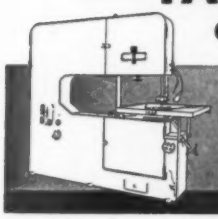

TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
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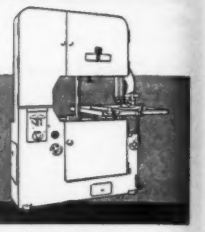
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



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Drill Hardened Steels without Annealing—

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

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With "HARDSTEEL"

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ON A PRODUCT INDICATES YOUR PRIDE IN PRODUCTION

Yours is a quality product, and it deserves the *best* in identification. *Show* your pride in it by marking it with distinction.

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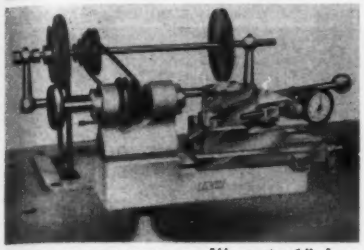
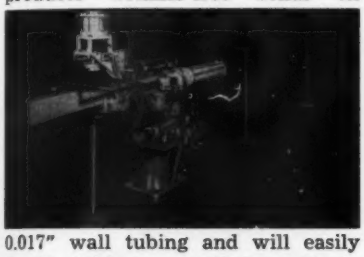
A Precision Radius Turning Machine can be used for turning small metal parts used in the instrument field. This small machine can turn



concave or convex radii up to 1", has a 2" travel, and a head stock with a collet capacity of either 3/16" or 5/16". Louis Levin & Son, Inc., 3610 S. Broadway, Los Angeles 7, or — **A50.**

Bend Copper and Aluminum Tubing up to 180° at speeds that range up to 900 bends/hr with the Model S Bend-Ex serpentine bender. It produces wrinkle-free bends on

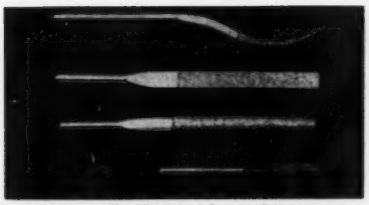


0.017" wall tubing and will easily handle tubing up to 40' long, ¼" to ⅝" dia on minimum centerline radii. Paul Machine Tool Div'n, Paul Machine Tool & Die Works, 4600 S. Kedzie Ave., Chicago 32, or — **A51.**

A Mechanical Loading Arm eliminates the need for operators to lift fixtures manually. This feature has been added to the Spin-Finish ma-

chine to provide quick, easy pick-up of fixtures for loading and unloading the machine. Grav-i-Flo Corp., 400 Norwood Ave., Sturgis, Mich., or — **Circle Inform-A-Gram No. A52.**

A Riffle File coated with 90-micron diamond particles is available in four shapes. These rifflers, together with straight diamond files in numerous shapes and sizes, provide fast, economical cutting action with longer service. They can also

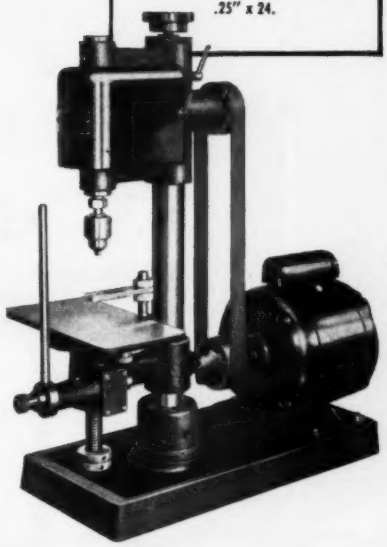


operate at high speeds and temperatures. Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or — **A53.**

A Heavy-Duty, Rotary-Vane Type Pneumatic Tool is cool-running up to 25,000 rpm with power to maintain high speeds even under heavy loads when grinding, burring, and finishing. The Dotco Model 2GL can accept ⅜" shanks of larger wheels, burrs, and sanding discs. For information write to Doeden Tool Corp., Sherwood, Ohio, or — **No. A54.**

Now *Precision* TAPPING OF THIN AND BRITTLE MATERIALS

Hamilton Super Sensitive, Small-Hole, Precision Tapping Machine.
Capacity — .034" x 120 to .25" x 24.



Recent design change provides a simple homing device as a standard component of the

HAMILTON SUPER SENSITIVE, SMALL-HOLE PRECISION TAPPING MACHINE

and makes routine of such problem work as the tapping of precision holes in thin metal sheets or in brittle plastics. Even improves performance in the tapping of blind holes!

YOU

will want full information about this important development!

WE WILL FURNISH IT

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USE IT WITH CONFIDENCE

2463

CIRCLE INFORM-A-GRAM KEY NO. 133

For Pointing, Spotting, Centering and Spade Drills used on non-ferrous, steel, and plastics, use the drills announced by B & W Precision Products Co., P. O. Box 3865, Detroit 5. All sizes of the flat spotting and centering drills may be repointed for either right or left hand cut on each side of the fixture. For information, write to the company, or — **No. A55.**

A New Diamond Wheel For Electrolytic Grinding gives immediate start with no break-in time necessary, longer life, and high peak removal for longer intervals. The E-2 Bond also has high conductivity, increases the coolant to the point of contact, and has less corrosive action. A.I.T. Diamond Tool Co., 8221 N. Kimball Ave., Skokie, Ill., or — **Circle Inform-A-Gram No. A56.**

Gain the economies of

AUTOMATION!

NEW chain-driven FEDERAL dial feeds

Federal Chain-driven Dial Feeds eliminate the need for specialized and more costly machinery. With automatic feeds and ejectors, these rugged presses step up production three to six times. Special jigs make their application virtually unlimited. Rotating table is driven by automotive, timing gear-type chain and provides 50% greater working area for the operator. Index and work plates operate on thrust bearings. Shot pin with tapered bushing assures absolute accuracy at each index. Rugged. Precision built. Eight sizes. Six to eighty ton capacities. See your dealer or write today.

Model 3— 26-ton capacity

FEDERAL PRESS COMPANY, 807 Division St., Elkhart, Indiana

FEDERAL DIAL FEED PRESSES

33 Years' Experience in Dial Feed Engineering and Construction

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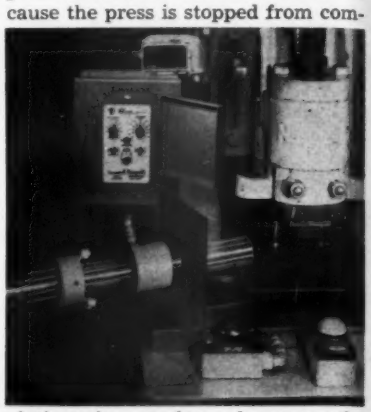
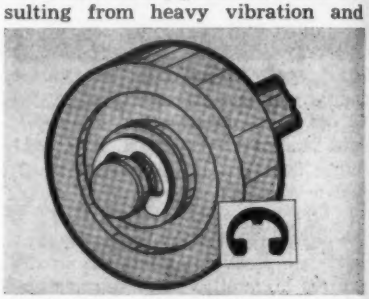
Eliminate Double-Heading of Punch Presses with the electronic press control. Die breakage and press downtime are lessened because the press is stopped from completing its stroke whenever the stamped piece is not properly ejected from the die. Robotron Corp., 21300 W. 8 Mile Rd., Detroit 19, or — **Circle Inform-A-Gram No. A57.**



A Radially-Installed Reinforced E-Ring provides great gripping strength and high rpm limits. The Truarc Series 5144 is designed for use where strong push-out forces resulting from heavy vibration and shock loads, high rotational speeds, or relative rotation between the retained parts are found. Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y., or — **No. A58.**



Increased Rigidity to 2.6 Times that of Steel Bars is a feature of Kennametal encased Kendex boring bars. They come in two styles and eight sizes each from $1\frac{17}{32}$" to $3\frac{1}{16}$" minimum boring dia, and are made with a heavy sleeve of Kennametal over a steel core. Kennametal Inc., Latrobe, Pa., or — **Circle No. A59.**

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NEW CONCEPT IN AUTOMATIC DRILLING AND TAPPING UNITS

MODEL 500
DULL TOOL LITE
AND
SUB-BASE

AUTOMATION | DRILLMATION | TAPMATION

Drillmation's hydraulic, locked-circuit feed Drilling and Tapping Units are the finest and most completely self-contained of any similar unit available today. Drillmation also offers more essential and exclusive features. Write TODAY for literature.

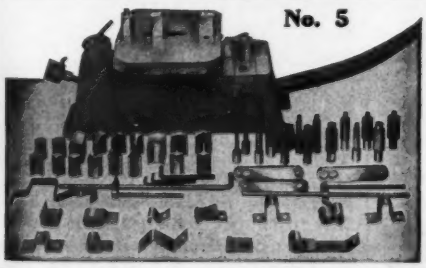
12 ESSENTIAL Exclusive FEATURES in 1 Unit

- **DULL TOOL CONTROL** Unit will withdraw tool from work and indicate to operator when tool becomes dull.
- **RAPID TOOL CHANGE** Tool may be replaced without changing the controls.
- **UNIFORM TIME CYCLE** Maintains comparatively constant time cycle even when tools become dull.
- **SELF-CONTAINED HYDRAULIC SYSTEM** Delivers only the oil pressure required to overcome machining resistance.
- **COMPLETELY AUTOMATIC** Enclosed electric controls. Unit is "Fail Safe".
- **THRUST CONTROL** Maximum thrust may be set to protect tools. Will not surge at break point.
- **FEED CONTROL** Infinitely variable and positive feed rate.
- **RAPID APPROACH AND RETURN** Variable irrespective of RPM.
- **MICRO DEPTH CONTROL** Depth will repeat within .0005 inch.
- **EMERGENCY QUILL RETURN** Button on front of unit. Aid in setting tools.
- **COOL OPERATION** Low volume high pressure hydraulic pump used on power stroke only. Air power used for rapid traverse.
- **PRODUCTION MACHINE** Mount in any position. Quiet operation. Self lubricating.

DRILLMATION

DRILLMATION CO.
6500 E. ELEVEN MILE ROAD
CENTER LINE, MICHIGAN
JEfferson 9-2030

CIRCLE INFORM-A-GRAM KEY NO. 1351



No. 5

Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air or hydraulic models. The MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛" x 1½" as illustrated. Punching dies available. Other models up to ½" x 8" hydraulic operated. Ideal for steel rule die forming.

ALSO AIR OPERATED MODELS

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J. A. RICHARDS COMPANY

KALAMAZOO, MICH.

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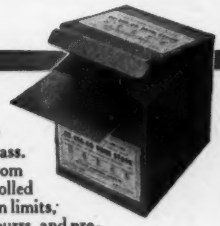
SPECIFY TOP QUALITY

DE-STA-CO

ARBOR SPACERS SHIMS and SPACING COLLARS • Arbor Spacers and Shims in 20 sizes and thicknesses from .001" to .125". Arbor Spacers furnished with standard keyway; Shims, with no keyway. Also Spacing Collars in numerous popular diameters, and in thicknesses from ⅛" to 3". Hardened and ground; edges chamfered. Furnished with standard keyway.

FEELER STOCK • Made from tempered stock, rolled to close tolerances, ½" x 25' coils packaged in transparent plastic boxes, except above .020". Strips ½" x 12", in cellophane. 27 thicknesses. All thicknesses from .001" to .032". (For use in precision fitting, checking clearances, inspection and production work.)



SHIM STOCK • Steel or brass. Selected from material rolled to precision limits, free from burrs, and protected by oil coating. Coils packed in carton for easy dispensing and protection. 15 thicknesses, .001" to .032". Sheets 6" x 12"; coils 6" x 120". Available also in two assortment packages —12 thicknesses, .001" to .015", and 15 thicknesses, .001" to .032".

DE-STA-CO

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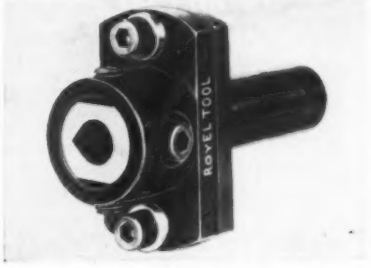
and Price List!

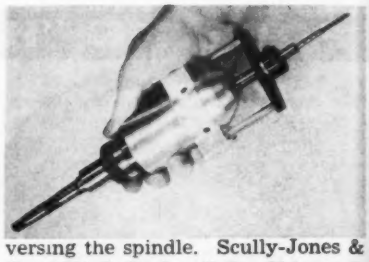
DETROIT STAMPING CO.
344 Midland Ave. Detroit 3, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1353

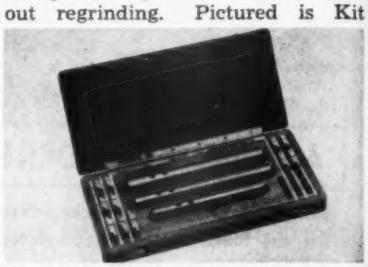
Precision Reaming with quick and accurate setup can be accomplished with the self-centering, adjustable floating reamer holder. Because the bushing is designed to accommodate a wide range of sizes of reamers, the holder needs no accessories. Capacities are from 1/16" to 19/32". For information, write to RoyEl Tools, 4221 Excelsior Blvd., Minneapolis 16, or—**Circle Inform-A-Gram No. A60.**



Prevent Tap Breakage and Increase Tap Life using the Safe-Torque tap driver. It is available either as a complete set or as an assembly that includes the driver, taper shank arbor, hex wrenches, and stop rod only. The tap driver is ideal for tapping operations on machines which have no means for reversing the spindle. Scully-Jones & Co., 1901 S. Rockwell St., Chicago 8, or—**Circle Inform-A-Gram No. A61.**



Ream a Wide Range of Hole Diameters with a minimum tool inventory using two new reamer kits. These kits provide special diameters without regrinding. Pictured is Kit No. 1123 which contains three bars and 14 cutting heads. For information write to Madison Industries, Inc., Muskegon, Mich., or — **No. A62.**



A Lubricant and Rust Preventive prevents metal-to-metal contact, eliminates or reduces stickers and toxic fumes, and stays on the metal, insuring complete lubrication where needed. Hamicote is for use in die casting, forging, drawing, and stamping. For information, write Harry Miller Corp., 4th and Bristol Sts., Philadelphia 40, or — **No. A63.**

Spray Equipment for cooling and lubricating forming and cutting tools for metal and plastics has been announced by The DeVilbiss Co., Toledo, Ohio. The Multi-Mister is designed for use with any cutting tool to supply a fine mist of coolant liquid or light cutting oil at the point of contact. It increases tool life, produces better finishes, saves coolant material, and makes chips cleaner and easier to handle. **Circle No. A64.**

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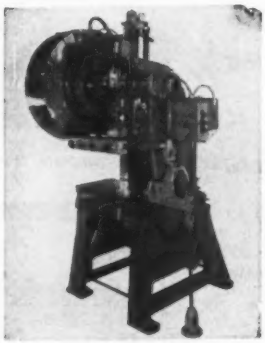
With PRESS-RITE POWER PRESSES



- *Handles greater variety of jobs*
- *Fast, easy set-ups*
- *For production or job work*
- *Greater production at lower cost*
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35 Standard Models 2 to 85 Ton Capacities

Always choose Press-Rite Presses for versatility. Greater shut height . . . large bolster area . . . variable speed drive . . . left or right flywheel design . . . single or continuous stroke . . . flanged rams . . . built-in design for die cushion . . . counter-balances . . . tilting mechanism . . . and many other features provide smooth operation over a wide range of jobs from drawing to punching.

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CIRCLE INFORM-A-GRAM KEY NO. 136

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GET THIS FREE CATALOG on Work Holding Tools NOW!

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This catalog shows the most complete line of work holding tools available anywhere for production on milling machines and drill presses . . . angle vises . . . drill press vises . . . swivel machine vises . . . adjustable angle plates with or without swivel bases . . . production vises . . . heavy duty angle vises . . . rotary and indexing tables for use on milling machines and drill presses . . . milling attachments for milling on lathes.

There are 68 different models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories, with jaw sizes from 1½" to 8". Ask for your copy of this FREE Catalog No. 205 today, showing the complete line, details and prices.

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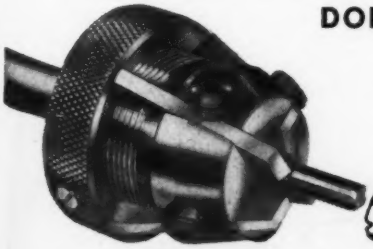
TUBE DEBURRING TOOL

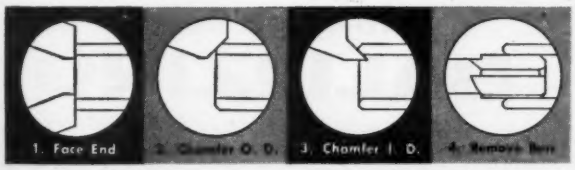
DOES 4 JOBS AT ONCE



ROUGH END . . .

BRASS • COPPER
STEEL • ALUMINUM

. . . TO FINISHED END



- Replaceable cutters
- Replaceable pilot reamers
- Adjustable for size control
- Easily reground in your plant

Standard sizes for 3/16" to 1-1/4" tubing.

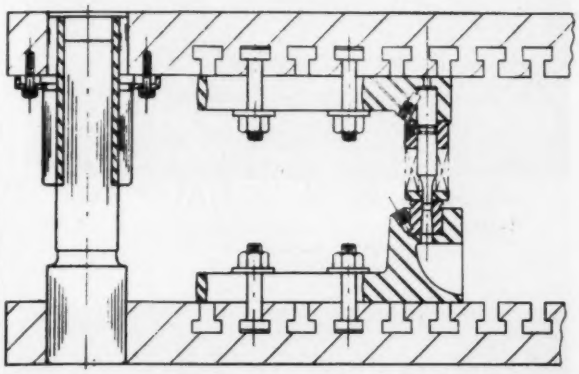
Write for Bulletin 46P

GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills - Facing and Counterboring Tools - Special Production Tools
Tube Deburring Tools - Since 1908

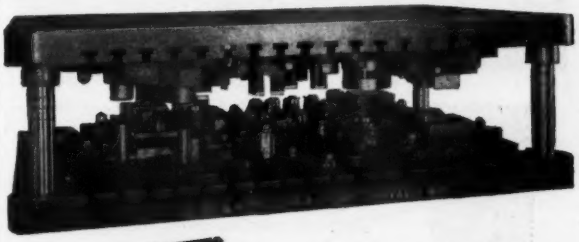
CIRCLE INFORM-A-GRAM KEY NO. 1372

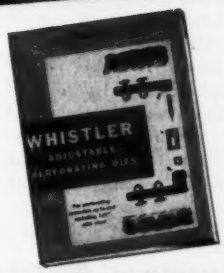
ADJUSTABLE DIES by WHISTLER

• Operate like a single purpose die • Easy to set-up and make changes • Interchangeable and re-usable parts always ready for a new job • Reduce die costs to a new low • Pierce holes in any desired arrangement of shapes and sizes • Precision piercing of materials to ¼" thick steel.



Above: Sectional drawing of a Whistler adjustable punch and die unit assembled in T-slot die set. **Below:** A completely assembled Whistler adjustable die ready for the press.





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to see for yourself in dollars and cents what this adjustable die making method can do for your plant. Send for it right now...without obligation.

S. B. WHISTLER & SONS, INC.
748 Military Road, Buffalo 23, N. Y.

ADJUSTABLE, MAGNETIC and CUSTOM DIES FOR ALL INDUSTRY
Direct Factory Representatives Located in Principal Industrial Areas

CIRCLE INFORM-A-GRAM KEY NO. 1373

FREE... 64 PAGE CATALOG

WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

COMPLETE DETAILED SPECIFICATIONS
ENGINEERING DRAWINGS • COST SAVING DATA
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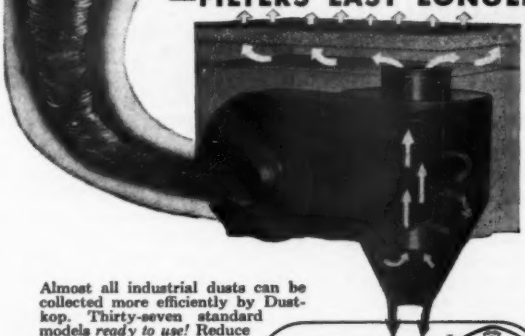
JERGENS TOOL SPECIALTY CO.
Dept. TP-5 712 E. 163rd St., Cleveland 10, Ohio
CIRCLE INFORM-A-GRAM KEY NO. 1381

CYCLONE SEPARATION

FOR MORE EFFICIENT DUST COLLECTION —FILTERS LAST LONGER



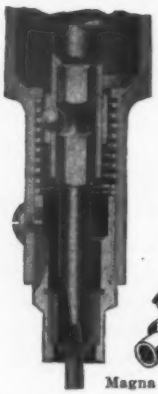
Almost all industrial dusts can be collected more efficiently by Dustkop. Thirty-seven standard models *ready to use!* Reduce installation costs — save space. Write for descriptive literature.

ALSO A COMPLETE LINE OF MIST COLLECTORS

DUSTKOP STOPS DUST

AGET MANUFACTURING COMPANY
1394 EAST CHURCH ST., ADRIAN, MICH.
CIRCLE INFORM-A-GRAM KEY NO. 1383

For driving slotted screws
MAGNA FINDER
does it easier, cheaper



The Magna Finder picks up the screw, positions it...so that with one-hand control the bit automatically enters the slot of the screw and drives it home. Alnico Magnet has ten times ordinary "pull" and positively positions screw. Results? Production up, costs down.

Interchangeable with regular power screwdriver finders. Available for *all* makes of power drivers and *all* kinds of screws. Thousands in use. Ask your power screwdriver salesman for a demonstration of the complete Magna Driver line.

Magna Finder—U.S. Patent #2,671,484

NEW manual ready; write Dept. 88-F. Complete information on Magna Bit Holders, Finders, Sockets and Hand Screwdrivers. Magna Driver Corporation, 779 Washington Street, Buffalo 3, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1382

16-Page Bulletin on
BALLIZING

. . for fast, accurate, low-cost hole sizing and finishing. Describes the process and its advantages — gives working data — tells savings obtained on wide variety of jobs — shows new ballizing equipment, including universal fixture.

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MANUFACTURERS OF PRECISION BALLS AND BEARINGS
3685 JACKSON ROAD
ANN ARBOR, MICHIGAN
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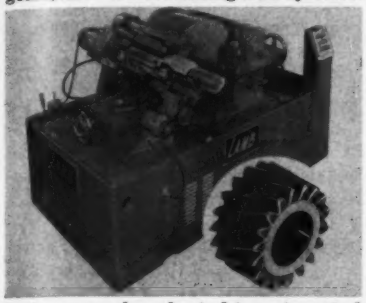
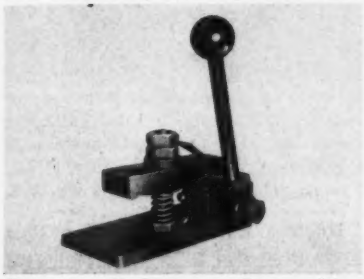
A Gear Tooth Chamfer Grinder can debur and chamfer hardened gear teeth at the rate of 900 to 2100 gears/hr. Work loading and ejection



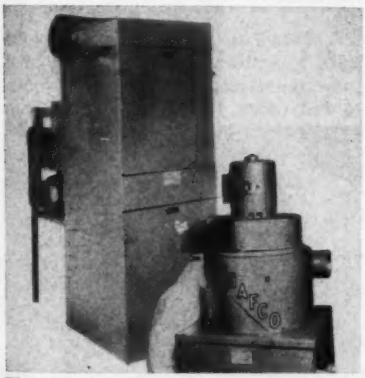
features can be adapted to automated parts handling systems or loading can be manually performed. F. Joseph Lamb Co., 5663 E. 9 Mile Rd., Detroit 34, or — **Circle No. A65.**

Blocks for Use with Hook and Swing Clamps are announced by Monroe Engineering Products Inc., 1515 Hurd Rd., Monroe, Mich. Use



them to eliminate costly machine work such as building a cast iron base plate or weldment and then machining the plate to receive the clamps. For information write to the company, or — **Circle No. A66.**

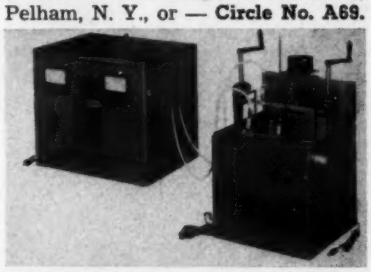
A Portable Dust Collector is ideal for individual machine installations where moderate capacity is required and where valuable gems and metal dusts are retained for reclamation.



The Chafco Spriaclone can serve a number of machines not simultaneously operated. For information, write Chicago Air Filter Co., 3723 Grand Blvd., Brookfield, Ill., or — **Circle Inform-A-Gram No. A67.**

A Low-Cost Carbide for general purpose use has been announced by Newcomer Products, Inc., Latrobe, Pa. NewPro is available in grades for cutting steel, and cast iron and nonferrous materials. Standard sizes and styles of triangular and square Throway inserts for mechanical tool holders and triangular and square Throway milling cutting blades are made of this carbide. **Circle No. A68.**

Designed for Salvaging Worn Parts, prolonging cutting tool life, plating friction parts against wear, and protecting against rust and corrosion, use the Model A, 75 Chromplater. It will deposit from 0.0001" to 0.010" of chrome on taps, dies, drills, etc. For information, write to The Dawson Corp., 302 5th Ave., Pelham, N. Y., or — **Circle No. A69.**



Machining Tough High Heat-Treat Steel

Helicarb Cutters beat conventional cutters 25-to-1

Report from Menasco Manufacturing Company, Burbank

To produce this landing gear part requires a straight slab cut ending with a radius. Specifications call for a dimensional tolerance of 0.006" and a finish of 100 rms with no mismatch or mark permitted.

After extensive tests with various kinds of slab mills proved unsatisfactory, Menasco tool engineers turned to a one-piece, 6"x5" *Helicarb* Slab Mill.

Helicarb Cutters produced 25 to 28 parts between sharpenings as contrasted with one part per sharpening with high-speed steel slab mills. *Helicarb* Cutters were re-ground 18 to 20 times before re-tipping was required.

Finish was consistently above the 63 rms set by Menasco and well above the 100 rms required by the customer.

JOB DATA

Material: SAE 4340 Chromoly strut forging
Tensile Strength: 280,000 psi
Hardness: Approximately 54 Rockwell C
Machine: Cincinnati No. 6 Horizontal Mill
Feed: 43 sfpm
Speed: 27 rpm
Job Instructions: Machine after heat-treat
Finish Required: 63 rms or better
Dimensional Tolerance: 0.006"
Parts Per Grind: 25 to 28

HELICARB Trademark *the competitive edge!*

Sonnet Tool and Mfg. Co.
576 North Prairie Avenue
Hawthorne, California

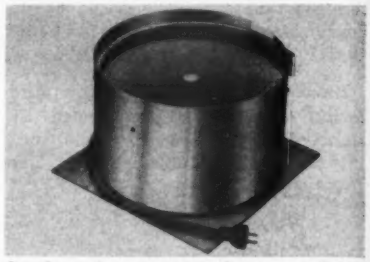
CIRCLE INFORM-A-GRAM KEY NO. 139

Automated Die Handling and Storage is provided by the Model WW1-120 Walkie-Worklifter. The battery powered unit elevates dies and operator, besides transporting. The unit has a 2000-lb capacity and can work at shelf heights up to 10'. Economy Engineering Co., 4509 W. Lake St., Chicago 24, or — **No. A70.**

A Cam Type Clamp, utilizing interchangeable, soft metal pads, is available in sizes from ¼" to ⅝". It offers fast action for light-duty clamping at one end where quick movements in a restricted space are necessary. The pads, attached to the

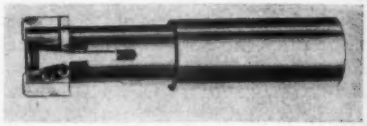
strap by two screws, facilitate quick changes, and can be easily shaped to fit any work surface. Jergens Tool Specialty Co., 712 E. 163 St., Cleveland, or — **Circle No. A71.**

A Small Vibratory Parts Feeder will increase speed and accuracy and lower the cost of the processing of rivets, screws, nails, bolts, etc. The unit consists of an integrated bowl



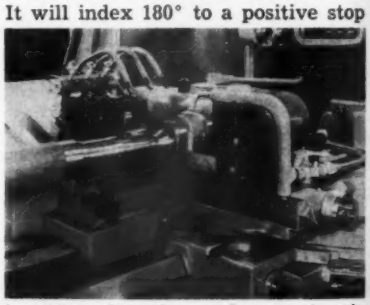
fixed to electromagnetic power drive ready to install to the machine doing the work. For information write to Burklyn Co., 3429 Glendale Blvd., Los Angeles 39, or — **Circle No. A72.**

Rapidly Expand or Reduce Hole Sizes produced by the Clark boring tool without removing blades from the bar or removing boring bar from



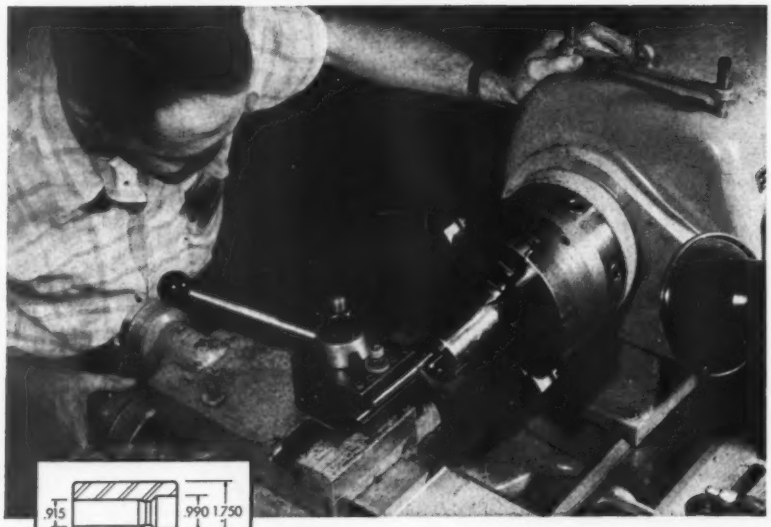
the setup. This tool is also capable of heavy cuts for roughing operations. Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif., or — **Circle No. A73.**

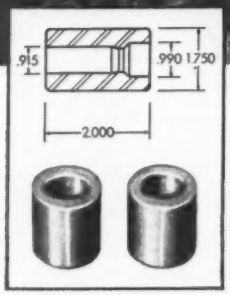
A Two-Position Automatic Turret with hydraulic actuation is designed to accommodate two 1" x 1½" tools. It will index 180° to a positive stop



in either direction and operation is automatic. Programming can be varied to meet different machining requirements. The Monarch Machine Tool Co., Sidney, Ohio, or — **A74.**

MONARCH LATHE
with *Buck* AJUST-TRU® CHUCK
"Cuts blind boring time 10% to 90%"





Add precision to precision and you're bound to end up with more precision. And that's the result of using the Monarch lathe with the Monarch "Air-gage Tracer" *plus a Buck chuck* for close-limit blind boring. In the job shown, Monarch cut a 2 hour job to 15 minutes, tolerances within ±.0005". They report production increases of from 10 to 90% on similar work.

In any tool and chuck combination — *"It pays to chuck with Buck!* Send for catalog for full details.

BUCK TOOL COMPANY

518 SCHIPPERS LANE • KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 140

CIRCLE TYPE ANCHOR BUSHING— LAMINATE PLASTIC TEMPLATE

STANDARD TYPE ANCHOR BUSHING— SHEET METAL TEMPLATE

U. S. PATENT 2483686 ON METHOD AND PRODUCT. FOREIGN PATENTS PENDING. TRADEMARK REGISTERED.

DO PRECISION FREE HAND DRILLING

WITH ANCHOR BUSHING® DRILL TEMPLATES

To eliminate inaccurate hole locations, wrong drill hole size or off-perpendicular drilling, use Anchor Bushing drill templates when doing free hand drilling to obtain interchangeability of parts and economy in high or low quantity production runs.

Anchor Bushing drill templates can be made for a fraction of the cost required for conventional drill tooling. Anchor bushings are riveted or spotwelded to sheet metal or laminated into plastic material.

Any fabrication shop can make its own dimensionally stable drill tooling to fit flat, curved or compound forms without use of expensive equipment or highly skilled labor.

Learn how to do precision freehand drilling, *write for the Anchor Bushing Catalog.*

hi-shear RIVET TOOL COMPANY

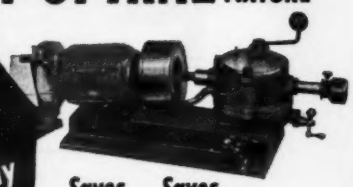
2600 WEST 247TH STREET · TORRANCE · CALIFORNIA

Sales Representative for Kirk-Wing Company, Vega Baja, Puerto Rico.

CIRCLE INFORM-A-GRAM KEY NO. 1411

Super MULTI-SPIRAL END MILL GRINDING FIXTURE

SHARPENS END MILLS Quickly... Completely IN YOUR OWN SHOP



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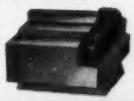
For grinding or milling of any spiral lead. Pays for itself in a hurry. Send for facts today.

SPIRAL SPECIAL CUTTING TOOLS

Cut Operations 75% or More!

Custom-designed, precision made, exactly to fit your needs. Boost both output and quality. Ask for details.



SPIRAL STEP TOOL COMPANY

Designers and Manufacturers of All Types of Special Cutting Tools

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CIRCLE INFORM-A-GRAM KEY NO. 1412

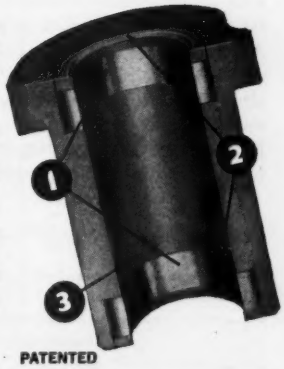
MEYCO CARBIDE INSERTED DRILL JIG BUSHINGS PROVE THEMSELVES

IN Automation!

The reason is simple: these unique bushings are ideally suited for long-running, uninterrupted operations!

MEYCO carbide inserted bushings assure long life for drills, jigs, fixtures . . . accurate work maintained, resulting in less down-time, fewer lost man-hours. Last almost as long as solid carbide bushings, cost slightly more than ordinary bushings. Get the full story:

Write for information and price list, ask for Catalog No. 41.



PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

EST. 1888

W. F. MEYERS CO., INC., BEDFORD, INDIANA

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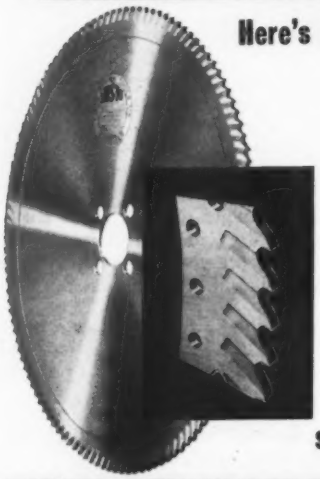

Here's Amazing Metal Cutting Savings!

Finest quality segmental saw blades carefully crafted by the world's largest saw blade producer and priced so low you can actually buy a new blade for less than you can resegment an old one. Insto Blades feature tungsten high speed steel segments of unsurpassed quality and narrow kerf for fast clean square cut without material distortion. Insto Segmental Saws are shipped from Cleveland stock in sizes 11" through 72" for ferrous and nonferrous applications. Save time, money, production delays, repair costs — write for details today!

Send For Free Wall Chart, Catalog and Prices
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ERNEST F. Donley's SONS, INC.

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most VERSATILE PIN GAGES made!

Horberg exclusive taper feature lets you check undersize, oversize and odd-size holes, slots, etc., quickly and accurately with standard letter, number or drill-size gages.

A precision concentric taper on the lower half of each gage runs to 0.0012" smaller than gage size. You get a continuously accurate range of measurement with each gage, for quicker, handier, precision gaging in set-up, machining, tooling and inspection operations.

SPECIFICATIONS

Diameter accurate to +0.0001" —0.0000"
Standard 1.5" length
Concentric taper on lower half to .0012" smaller size
Oil hardened tool steel

PRICES AND ORDER FORM (F.O.B. Bridgeport, Conn.)

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Sets furnished in indexed plastic case. Extra case $15.00
Prices subject to change without notice.

Please rush items checked to:

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Company_____

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Your Standard for PERFORMANCE— PRECISION— FIT!

Complete stocks assure prompt delivery. Outworn plugs and ring gages salvaged at low cost.

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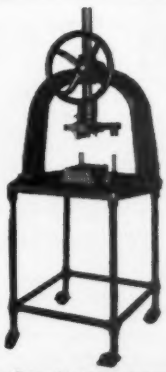

COMPLETE THE DIE-SET AT YOUR BENCH

Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the die-maker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

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MOORE SPECIAL TOOL CO., INC.
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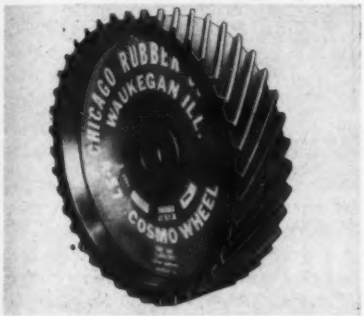
CIRCLE INFORM-A-GRAM KEY NO. 1424

Duplicate the Cut or Reset Any New Boring Tool Bit to within 0.0001" of the original cut in a fraction of the time with the Setmaster precision boring tool bit setter. New

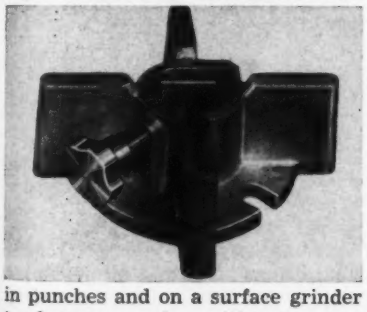
or sharpened boring tool bits will give the same performance, and the "feeling out" of exact bore sizes is eliminated. For information, write Aircraft Engineering & Mfg. Inc., 2A5 Norman St., Bridgeport, Conn., or—**Circle Inform-A-Gram No. A75.**

A Self-Aligning Rubber Contact Wheel features a self-aligning rubber molded arbor hub. This R-57 wheel aligns by centrifugal force, does not vibrate, and needs no aligning even



when spindles are worn. Speed automatically centers the wheel as it gains momentum, cutting setup time considerably. Write to The Chicago Rubber Co., Inc., Waukegan, Ill., for information, or — **Circle No. A76.**

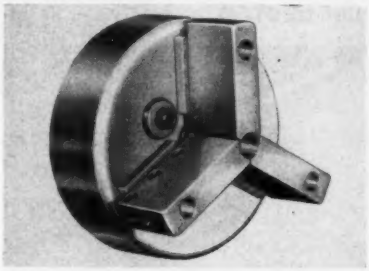
Eliminate use of Parallels and Blocks using the Durant punch holder. Adjustable for punch shanks ¾" to 2" dia, this punch holder can be used as a base for drilling and reaming accurate screw and dowel holes



in punches and on a surface grinder to sharpen punches without removing them from punch plate. Durant Tool Supply Co., 1-15 Thurbers Ave., Providence, or — **Circle No. A77.**

A Work Driver with serrated jaws milled on an angle to grip work better is used on any type of engine lathe, multiple tool lathe, or plain or universal grinder. This device is self-centering, quick-acting, and positive. For information, write Seneca Falls Machine Co., 11 Fyfe Bldg., Seneca Falls, N. Y., or — **Circle Inform-A-Gram No. A78.**

High Speed Precision Boring or Grinding on single and multiple spindles can be done with the new diaphragm chuck, with a recommended part range from ⅛" to 3" dia. The SC 401 has 3 adjustable jaws and fixed stop facilities, and assures consistantly controlled concentricity at spindle speeds up to 5000 rpm. N. A. Woodworth Co., 1300 E. 9 Mile Rd., Detroit 20, or — **No. A79.**



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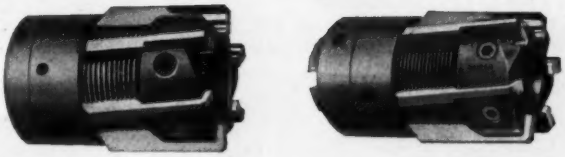
McCROSKY



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Standard of quality for more than 50 years, McCrosky Super® Adjustable Reamers combine the strength of solid reamers with the longer life, greater accuracy and lower costs of replaceable blade reamers. They cut freely without chatter; avoid any tendency to "dig in", and produce absolutely round, concentric holes with high surface finish. Users report they get more finished pieces—of better quality—in shorter time—at lower cost.

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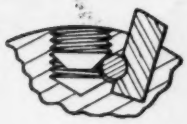

Our shop proved screw and pin locking device holds the blades firmly against the bottom and back of the blade slot assuring utmost rigidity. Thrust of the cut increases the locking pressure providing the effect of reaming with a solid tool. Blades can be released easily, and re-ground and re-used over and over again, reducing purchases of new blades to a minimum.

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Fully descriptive catalogs sent promptly on request. Write for yours today!

COST CUTTING TOOLS **McCROSKY TOOL CORPORATION** MEADVILLE, PA.

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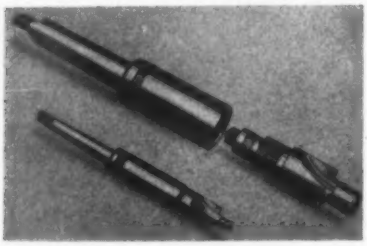
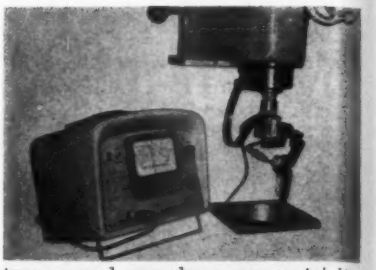
CIRCLE INFORM-A-GRAM KEY NO. 143

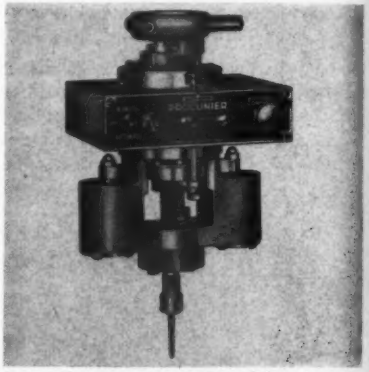
A Line of Cutters will produce the AND-10050 hydraulic port contours in steels and non-ferrous metals. They come in 13 standard sizes for hydraulic fittings used with ⅛" through 2" OD tubing. Ground form-relieved for simplified resharpening operations, these tools produce fine micro-finishes. For information, write to The Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich., or — **Circle No. A80.**



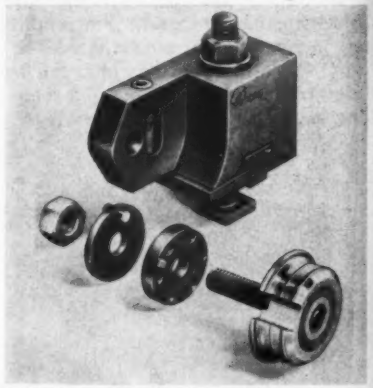
Locate or Measure Work Position and Dimension on any jig borer, jig grinder, and many other machine tools with rotating spindles with the Model XA-515 Ex-Ac work position locator. With this tool a jig borer can be used for locating and aligning work on the table, or measuring squareness, center to center distances, and roundness concentricity of holes or plugs. The Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, or — **Circle No. A81.**



Produce Uniform Precision Threads with minimum effort and skill with a new lead screw tapping attachment. The touch of a pushbutton feeds the tap automatically through its entire pre-set cycle without pressure on the tap itself. The need for any drill press air or hydraulic feed is eliminated. Procunier Safety Chuck Co., 18 S. Clinton St., Chicago 6, or — **Circle No. A82.**



Reduce Production Costs Using the Adaptool-Post, a fixture that makes it possible to use smaller, less costly form tools in larger sizes of screw machines. The fixture provides added versatility that allows larger machines to handle a greater variety of work sizes, eliminating machine tie-ups. The American Cam Co., Inc., P. O. Box 2106, Hartford, Conn., or—**Circle Inform-A-Gram No. A83.**



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POSITIVE FEED
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Marvel
MARVEL SAWS' Automatic Brain Adjusts Blade Feed Pressure and Depth on Every Stroke to
GIVE YOU FASTER CUTTING-OFF
Write for the MARVEL Catalog and complete details on MARVEL Saws
MARVEL SAWS
The exclusive automatic Dual Power Feed built into every MARVEL Series 6 and 9 Hack Saw is the "brain" that adjusts and compensates both pressure and depth of feed correctly in proportion to the number of blade teeth in contact with the work. Once the MARVEL Dual Feed is set, no operator attention is required to insure that the blade is cutting as deeply as possible and practical on every stroke . . . regardless of the changing area of the work being cut. Whether the Saw is being used for continuous automatic cut-off of identical pieces or a single cut, the MARVEL Dual Feed that practically "thinks for itself" guarantees that the work is cut-off in the fewest possible number of strokes.
Heavy duty MARVEL Series 6 and 9 Hack Saws embody every practical design and operating feature to give you speed, accuracy and operating economy you can find in no other metal cutting saws.
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MARVEL Metal Cutting SAWS
Better Machines-Better Blades

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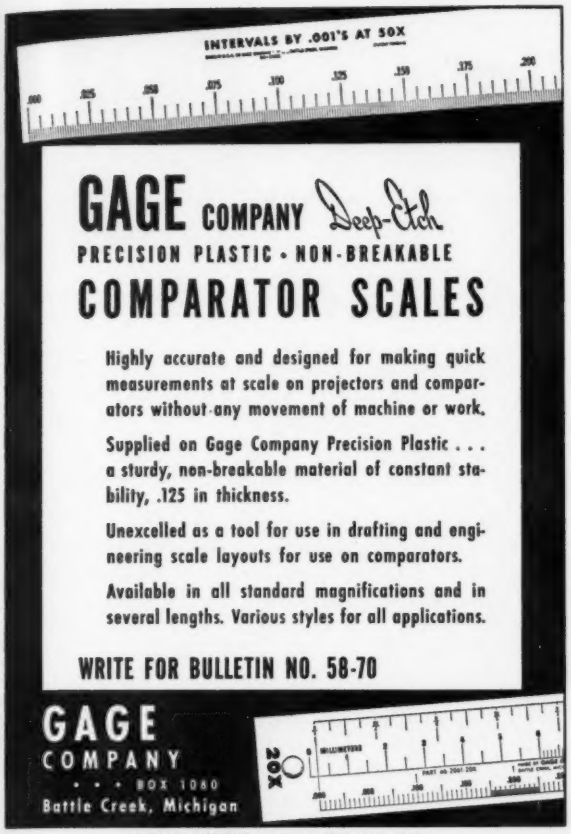
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Highly accurate and designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.
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have these exclusive* features

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Semi-Standard Heavy Duty Full Ball Bearing

½" in Cast Iron—1-7/16" min. centers 7⅛" or 9⅝" Dia.

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Also larger Adaptations and Full Line of Fixed Center Drill Heads.

• Standard Full Ball Bearing Construction including Spindles Driving assembly is FULL BALL BEARING mounted with 3 Bearings on each spindle. Thrust load carried by radial thrust bearings.

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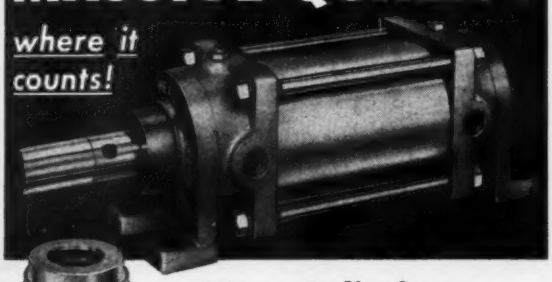

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"HILLCO" TANGENT CHASERS

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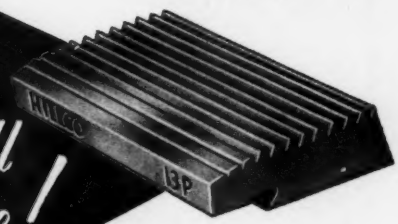

The new line of "HILLCO" Tangent Chasers, which can be re-ground for 80% of their original length, are guaranteed to be of highest grade tool steels ground to exacting tolerances. We feel that this complete line of chasers are the finest that we have produced in our 75 years of cutting tool manufacture. We think that you will agree with us.

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ALSO SAWS AND HONES

Attachments permit accurate sawing and honing with infinite speeds from 170 to 470 strokes per minute. Table can be tilted 15° front and back.

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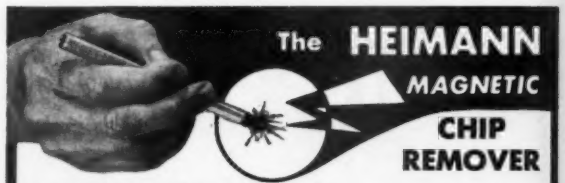

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THIS HAND IS IN THE CHIPS! Yes, and the chips are not in your eyes or hair or ways of machines. The Heimann Magnetic Chip Remover gets chips out of blind holes rapidly, cleanly, safely. It's a lastingly efficient permanent magnet in a knurled aluminum holder. Send it in after chips and it comes out covered with them.

YOU CAN'T AFFORD to be without it! A natural for your tool box or crib. Made 1/8" to 1/2" sizes, at a price to attract. Write now for circular.

Permanent — Easier
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HEIMANN MFG. CO., URBANA, OHIO

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Easily installed on cross-slide or turret

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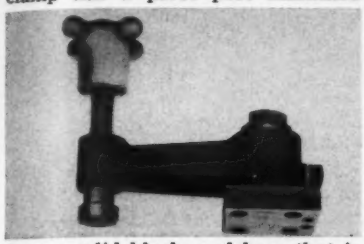
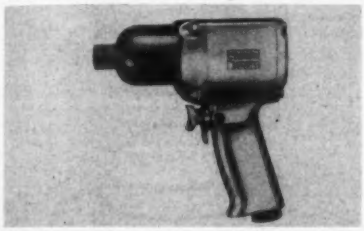
For Economy and Ease of Application use the mounted swing clamp announced by West Point Mfg. Co., 26935 W. 7 Mile Rd., Detroit 19. This clamp has a pivot post machined



from a solid block, and base that is secured to the fixture by 4 socket-head screws. It is available in 5 sizes. For more information write to the company, or — **Circle No. A84.**

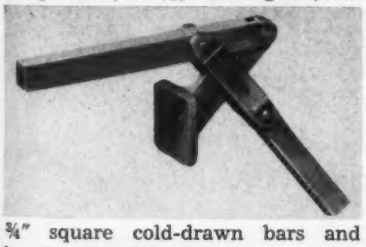
Faster Run Down, higher ultimate tightness, and lower maintenance are features of the J-40 series ⅜" air impact wrenches. Both the side throttle handle model (pictured) and



the lever throttle model have a direct drive (no gearing) high speed, powerful size bladed air motor. For information, write to The Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 32, or — **Circle No. A85.**

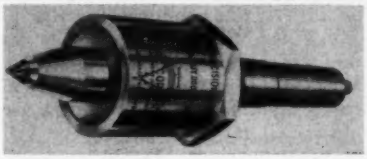
A Layout Fluid can be used on steel and cast iron as well as on brass, aluminum, and stainless steel. The surface need not be polished — just wipe it clean and brush the liquid on. It dries instantly. For a free sample, write to Dayton Rogers Mfg. Co., Minneapolis 7, or — **A86.**

For Rugged Chores use the toggle clamps which feature a holding pressure of 1,650 lbs. These Huskies have a forged alloy steel base, replaceable components, a 6 13/16" holding bar, and



¾" square cold-drawn bars and handles. The flanged and flat mounting surface is either horizontal or vertical (pictured). Detroit Stamping Co., 350 Midland Ave., Detroit 3, or—**Circle Inform-A-Gram No. A87.**

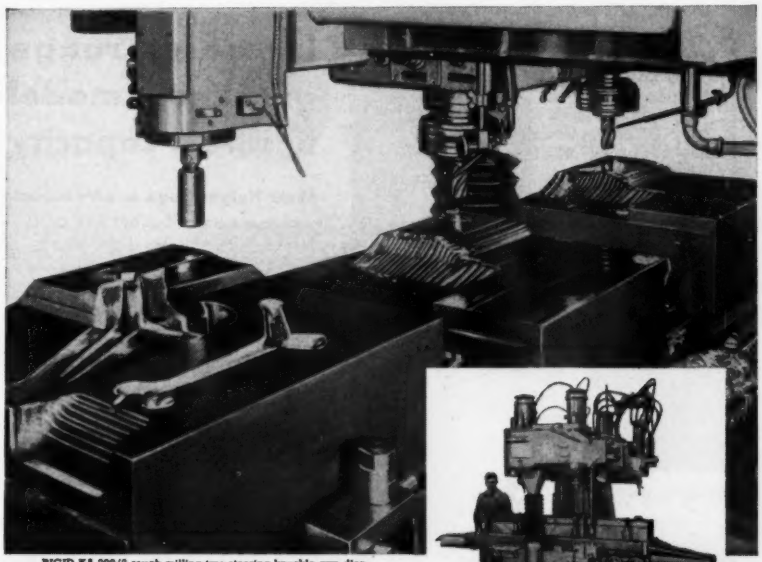
A Super Precision Live Center is accurate to 0.000020" for precision turning and grinding. The extended nose spindle is carbide tipped for



maintaining the original precision over long periods of operation. For information write to The Vee-Arc Corp., Westboro, Mass., or — **Circle Inform-A-Gram No. A88.**

Use a Cross Slide Milling Table on drill presses to perform milling operations. The Palmgren 192 is 18" x 9⅝", with longitudinal travel of 11" and cross feed of 6½". Large,

easy to read dials are graduated in thousandths. For information, write to Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17, or—**Circle Inform-A-Gram No. A89.**



RIGID KA-200/2 rough milling two steering knuckle arm dies

RIGID Model KA-200/2

Rigid *Provides—*

Fully Automatic Die-Sinking Finer Finish, Less Bench Time

A great improvement in accuracy and surface finish—with no increase in cutting time—is possible with these RIGID Die-Sinking and Hydrocopy Milling machines. Fully automatic machining permits a drastic cut in operator's supervision. Accuracy and high surface finish keep bench time to an absolute minimum—in many cases only polishing is necessary. A completely enclosed frame gives the machine tremendous rigidity to handle extremely heavy cuts. The RIGID is available in three sizes with 1, 2, 4 or 6 spindles. Largest copying area is 23¾" x 39⅞"

OTHER RIGID FEATURES

- Normal Working Accuracy of ± .002" or Closer
- Completely Vertical Copying, Up or Down
- Constant Surface Feed Over Any Contour
- Hand Control for Roughing
- Reverse Image Attachment
- Automatic 360° Profiler With Depth Control (Working Accuracy ± .002")
- Change-over from Transverse to Longitudinal Copy-Milling in Seconds

Write For Additional Information

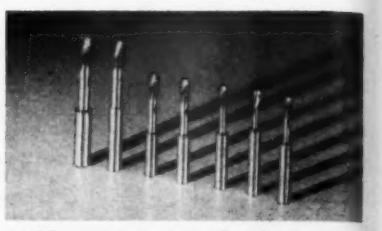
COSA — *nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 147

35-Ton Sheet Metal Forming Power Brakes have been announced by Service Machine Co., 162 Miller St., Elizabeth, N. J. Model 635 has a 72" bending capacity, 12 gauge, and Model 835 has a 96" bending capacity, 14 gauge, with 2" stroke and 4½" adjustment. The friction factor is almost eliminated because almost all movable parts have ball or roller bearings. For information, write to the company, or — **No. A90.**

Excellent Shearing Action and high chip ride-out are features of the spiral flute stub tap designed to solve

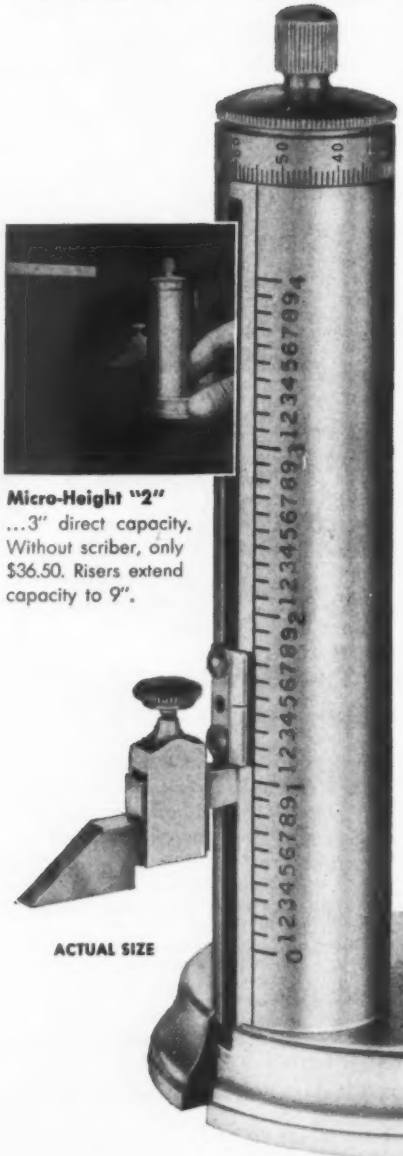


problems encountered when using standard taps in screw machines. A long necked section provides more chip room, reduces drag, and facilitates application of cutting oil or coolant to cutting edges. For information, write Jarvis Corp., Middletown, Conn., or — **Circle No. A91.**

GREIST MICRO-HEIGHT® "4"

increased range gives new model 5" direct capacity

Micro-Height "2" ...3" direct capacity. Without scriber, only $36.50. Risers extend capacity to 9".



ACTUAL SIZE

Micro-Height Gage speeds layout and inspection. Scribes like a vernier gage...holds dial indicator for quick, accurate inspections.

Reads faster than a micrometer. Hundredths on big barrel...thousandths on large head that cuts reading time, reduces errors, increases accuracy.

New Micro-Height "4". With scriber inverted, reads directly from zero at base to 5". Accuracy ± .0003". Price, without scriber, only $57. Adding lapped riser extends capacity to 11".

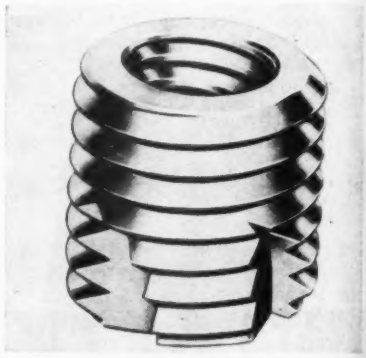
Ruggedly built for dependable accuracy. Protected by rustproof, satin-chrome finish. Micro-Height quickly pays for itself. Saves money whenever you measure, layout, inspect. Can you afford to be without one?

Call your ***GREIST*** *distributor or write*
THE **GREIST** MANUFACTURING COMPANY
485 Blake Street, New Haven 15, Conn.

Precision Products since 1871

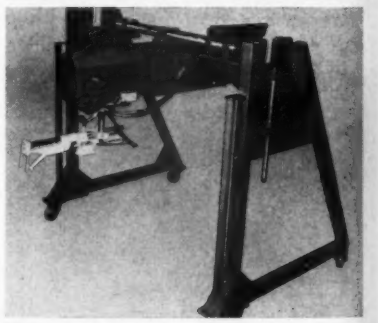
CIRCLE INFORM-A-GRAM KEY NO. 148

Speed-Sert, a self-tapping insert, is designed for installation into aluminum and magnesium alloys to provide a steel thread. Four extra sharp



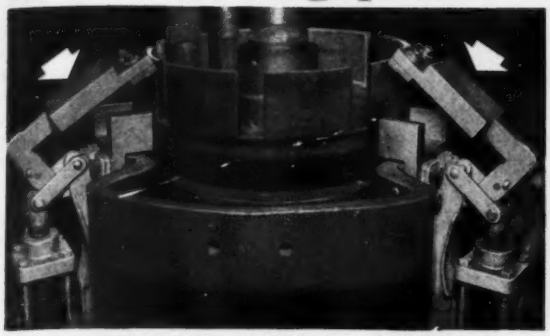
cutting edges enable the Speed-Sert to cut its own thread as it is rotated into a cored or drilled hole. Newton Insert Co., 6500 Avalon Blvd., Los Angeles 3, or — **Circle No. A92.**

A Geared Non-Slip Belt, that needs no lubrication and has run over a million strokes without stretching, is a new feature on the horizontal press extractor. This 600 Series horizontal iron hand can be



mounted on the press upright, on a conveyor, or on a universally adjustable rollaway base. Sahlin Engineering Co., Inc., P. O. Box 289, Birmingham, Mich., or — **Circle Inform-A-Gram No. A93.**

BIG--for big jobs



NEVER SEND A BOY—here's the Knu-Vise clamp, AO-200.

LAPEER CLAMPS FOR ARC WELDING

In the plant of a midwestern automotive parts manufacturer, air operated Knu-Vise clamps are an important part of a work holding fixture for arc welding. Shown is the operation where center hubs are welded into the high clutch splitter housing for automatic truck transmissions.

No job for a panty-waist, the husky Lapeer clamps have to grab securely—hold rigidly—let go instantly. They are part of a family of more than 150 models of clamps and pliers designed to do a tremendous number of holding jobs. Some are air-operated, others hand operated. All of them do workhorse jobs in industry holding big parts, small parts, unwieldy parts. Write today for more information.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

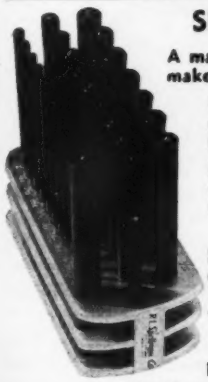
KNU-VISE PRODUCTS — **LAPEER MANUFACTURING CO.**

3064 DAVISON ROAD
LAPEER, MICHIGAN

WESTERN DIV., ART LEWIS PRODUCTION EQUIP. CO. 419 Magnolia Street, Glendale, California

CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD. 1131 Pettit Road, Burlington, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1491



SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand—sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1492

PRESSURELOK-224

the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

UNITED STATES DIAMOND WHEEL CO.
1833 ILLINOIS AVE. AURORA, ILL.

US

IMMEDIATE DELIVERY on all wheel sizes, STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

CIRCLE INFORM-A-GRAM KEY NO. 1493

Buy safe "SHUR-GRIP" drop forged HANDLES

Designed to hold 3 to 6 lb. head hammer heads more firmly — will not slip — keeps hammer head in shape longer — makes remolding easier, quicker, surer, less expensive.

Write for circular and prices

LAWRENCE H. COOK, INC.
68 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1494

BURR-BIT CUTS TAPPING COST WAY DOWN!

Just lock Burr-Bit on any make tap and holes are deburred automatically, leaving a smooth clean chamfer. ONE OPERATION, ONE SETUP, ONE HANDLING.

NEW ADDITION
Now Burr-Bit fits 3 fluted taps from #6 to ½". Also available to fit any tap 2 or 4 fluted from #2 to ¾", as well as heli-coil.

A quality product made of the finest high speed tool steel for use on almost every material.

WRITE now for complete data and reports from engineers who have adapted Burr-Bit and saved on their tapping operations.
INVESTIGATE Burr-Bit-today.

VERNON DEVICES, Inc.
481 E. 3rd Street Mt. Vernon, N.Y. MOunt Vernon 4-1686

CIRCLE INFORM-A-GRAM KEY NO. 1495

Commander SELECT-A-SPINDLE

DRILLS . . REAMS . . TAPS ON 1 DRILL PRESS SPINDLE

- **Increases production**
- **Improves accuracy**
- **Reduces costs**
- **Can be used on any drill press**

Compactly built — operator has complete visibility of work

Save time...reduce handling . . . improve accuracy —drill, ream and tap on 1 drill press spindle with a Commander SELECT-A-SPINDLE, Dual Speed Turret Head. Speed selection on each spindle permits drilling, counterboring and tapping at recommended speed. Taps on 1, 2 or all 3 spindles using any tap size within capacity. Quick, positive indexing of head without stopping motor . . . selected tool rotates only after spindle is indexed and automatically locked. Ruggedly built for high production work.

Write FOR CATALOG and the name of your nearby Commander Distributor

Commander MFG. CO.
4228 W. KINZIE ST • CHICAGO 24, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1496

Q-C SPECIALS

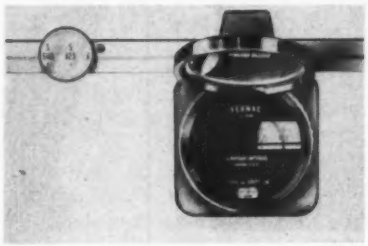
For more information about these products, use the postage-free Reader Service Card in this issue

VERNIER FOR TABLE POSITIONING

The Vernac, a direct reading optical vernier for indicating longitudinal, lateral, or vertical position of any machining tool table has been introduced by Simpson Optical Manufacturing Co.

Designed for incorporation on both new and existing equipment, the unit completely eliminates inaccuracies due to wear and stretch of table screws and damaged end rods and gage blocks. It can be read to an accuracy of 0.0001" without interpolation.

The precision-hardened stainless steel case of the Vernac is attached

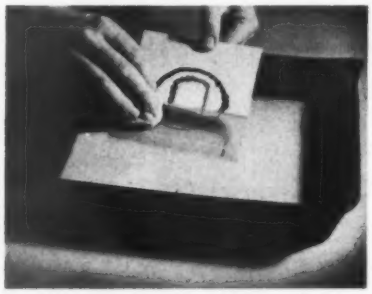


to the machine tool table. Scale readings are projected through a 22-power lens onto an illuminated, highly visible direct reading dial. Readings are in 0.025" intervals and can be refined on the order of 0.0001" by fine adjustment with a double spiral reticle. All readings are complete within the dial area; no reference to an outside pointer is required.

Once a reference point is established on the Vernac dial during tool setup, the setup and control of subsequent machining operations is simply a matter of adding and subtracting from this reference point. In addition to providing accurate start and stop measurements, the Vernac shows movement caused by table locking mechanisms and enables immediate compensating adjustment. Table movement errors are also indicated. **Circle No. S2.**

MAKE CLEAR PROJECTOR CHARTS QUICKLY

Comparator chart gages of professional quality can be produced in any shop with new "Fast-Line," a specially coated plastic 0.050" thick developed by Optical Gaging Products, Inc. Here's how it is done: The desired layout is scribed in Fast-Line and then brushed over with a special dye-like fluid. After dipping in a wash to remove excess fluid and the scribe coating, the chart is wiped dry



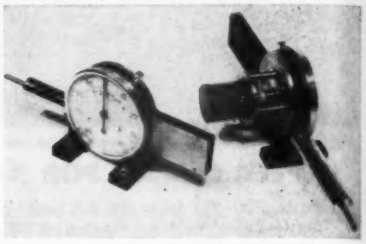
with a cloth or sponge and is ready for use. It takes less than 3 min to make an average chart, and requires no technical skills or special equipment.

The finished chart gages have sharp black or colored lines impregnated directly into the plastic. They are extremely resistant to wear and abrasion under shop conditions. The Fast-Line material has excellent stability with respect to temperature and humidity changes and is rated next to glass as a desirable chart layout material. Either clear or matte finished material is available in sizes to fit all makes of optical projectors. **Circle Inform-A-Gram No. S1.**

Take Precision Height Measurements economically and efficiently with gage block accuracy to any desired height with the Magna-Set sys-

tem. This system uses a Hite-Icator for measurements to 10" or 20", with 9" riser blocks to build greater heights. Brown & Sharpe Mfg. Co., Providence, or —
Circle Inform-A-Gram No. S3.

A Heavy-Duty Dial Indicator Gage, featuring a built-in potentiometer, has a measuring range of up to 4", reading in 0.001". It can be used for visual and electrical indication of position of travel of slides, cam

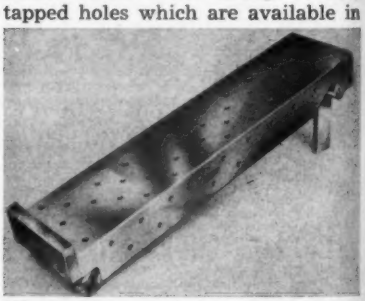


actions, and worktables; and provides an electric feedback signal for controlling automated machines or equipment. B. C. Ames Co., Waltham, Mass., or — **Circle No. S4.**

Extend the Initial Range of Optical Comparators, toolmaker microscopes, coordinate measuring stages, and small jig borers with gage blocks. A

7-block set consists of ⅛", ⅛", ¼", ½", 1", 2", and 3" blocks. Guaranteed accuracy is +0.000006", −0.000002". Opto-Metric Tools, Inc., 137 Varick St., New York 13, or — **Circle Inform-A-Gram No. S5.**

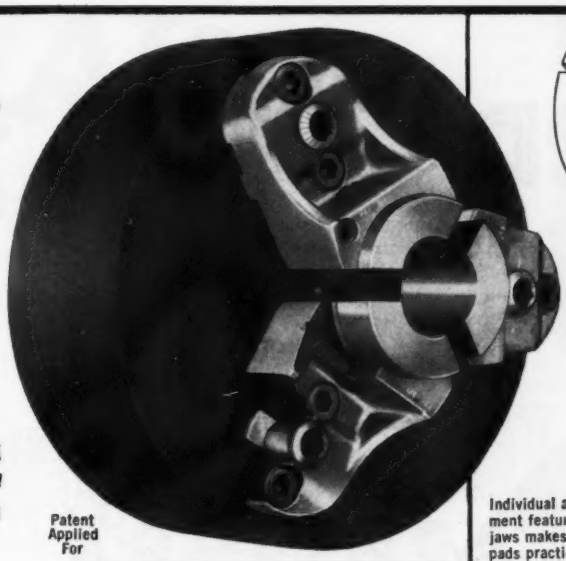
Check and Measure Large Work with 20" sine blocks. Model 9118-20 allows work to be clamped using tapped holes which are available in



all working surfaces. Sine plugs, ¾" dia, provide a line contact wherever desired throughout their 2⅛" length. Taft-Peirce, Woonsocket, R. I., or — **Circle No. S6.**

More QC Specials on page 153

Takes MINUTES to ADJUST . . . SAVES HOURS OF REBORING!



Patent Applied For

Individual adjustment feature of jaws makes hard pads practical for most jobs.

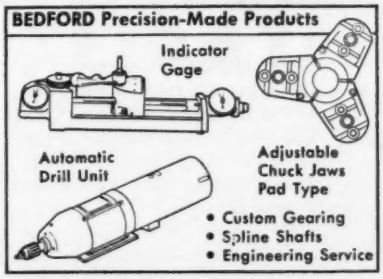
The ONE . . . Accurate, Individually Adjustable, Chuck Jaw . . . *on Today's Metalworking Market!*

1. Adjustment feature has .022" total movement.
2. Eliminates reboring.
3. Individual adjustment of jaws makes hard pads practical for most jobs.
4. Has rigidity of solid jaw.
5. Adaptable to most power or scroll chucks.

SAVE TIME! Soft Pads can be "finish bored" in tool room for spetific job . . . *greatly reducing production line "set-up" time.*

FAST SERVICE! Bedford stocks a complete assortment of Standard Adjustable Chuck Jaws and Hard or Soft Pads . . . *for immediate delivery.*

BEDFORD Precision-Made Products



- Custom Gearing
- Spline Shafts
- Engineering Service

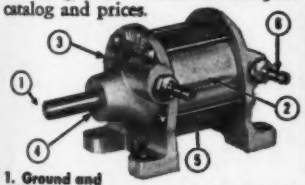
WRITE FOR FREE CATALOG AND DATA SHEETS

CIRCLE INFORM-A-GRAM KEY NO. 1511

AIR-MITE AIR CYLINDERS

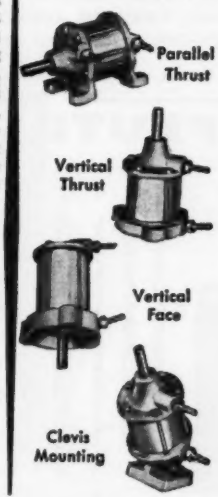
Low Cost . . . Compact . . . Powerful . . . Rugged

AIR-MITE Cylinders—made in single or double acting series—in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling or lifting is required, AIR-MITE cylinders will meet your most exacting standards of dependability and long life. Write for complete catalog and prices.



1. Ground and polished steel ram
2. Brass, true-bore cylinders
3. High strength aluminum alloy cylinder heads
4. Bronze oilless ram bushing
5. Five steel tie rods
6. Brass hose stems

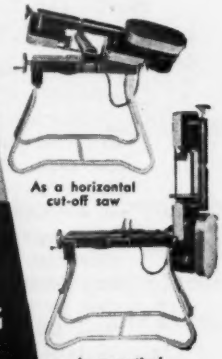
4 Mounting Types



CIRCLE INFORM-A-GRAM KEY NO. 1512

You CAN take it with you . . . or use it in the shop

THE VERSATILE **WELLS 49A** METAL CUTTING BAND SAW



Use the Wells 49A in the shop, or take it to the "job-site"—you'll find it an efficient tool—a time and money saver on a wide variety of metal cutting jobs.

As a horizontal cut-off tool it has a capacity of 3½" x 6". One easy motion converts it to a vertical band saw. No tools required! Just swing the head into upright position—it's ready to use. Cut angles, slots, do light contour work.

Get TWO saws for the price of ONE!

Write for complete information.

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

Wells Manufacturing Corporation

1940 Cedar Street, Three Rivers, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1513

new
FORD
solid carbide
END MILLS

WHY THEY DO YOUR JOB BETTER

All Ford end mills are *precision machine ground from the solid* . . . which insures uniformly accurate flute form and a constant relief angle. On your job, that means more parts per grind. So you save labor on grinding and tool changing. You save on replacements. You save on downtime. What's more, there's less time per part, more parts per hour, fewer rejects. Available in 11 types . . . all standard, and *available.*

Rotary FORD Tools

BULLETIN 510 FREE AND LATEST PRICES . . . WRITE TODAY

M. A. FORD MFG. CO., INC.

1553 ROCKINGHAM ROAD
DAVENPORT, IOWA

Precision manufacturer of H. S. S. and Carbide Rotary Files and Cutters • Countersinks • Grinding Burrs • Special Tools • Factory Regrinding

CIRCLE INFORM-A-GRAM KEY NO. 1521

WHAM and there goes spindle accuracy

Our illustrated "character" is about to ruin spindle accuracy with a hammer and drift key that cost a lot of money to get in the first place. Modern P.D.Q. tooling can eliminate this abuse . . and save time and money as well. A quick one-sixth turn of the holder nut releases the adapter and you're ready for the next operation . . . it's as easy as that. How about those machine tools in *your* plant? Get the facts on P.D.Q. tooling . . Write fc complete information.

Representatives in principal cities.

PDQ **PORTAGE Double-Quick, Inc.**

1046 SWEITZER AVENUE • AKRON 11, OHIO

CIRCLE INFORM-A GRAM KEY NO. 1522

90FS FLUTE GRINDER

Automatic Universal

Grinds straight or spiral flutes from solid, including carbides, in tools such as:

- Drills as small as 1/16 inch dia.
- Spiral or straight taper reamers.
- Spiral or straight milling cutters and end mills.
- Sharpens saws up to 12 inch in diameter and in gangs up to 7¾" long.

WARDWELL

3809 Ridge Road
Cleveland 9, Ohio

AUTOMATIC INDEX FEED

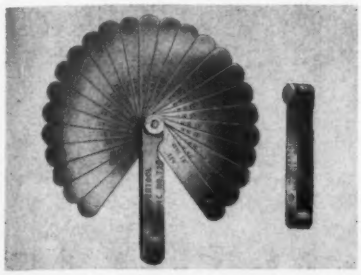
Write for free Bulletin 90-FS

CIRCLE INFORM-A-GRAM KEY NO. 1523

Instrument Work, fine punching, staking, or forming operations can be done with the Mini-Line press. Uses include eyeletting, pressing in bearings and pins, and riveting. The press has a controlled ⅜" stroke, and can be operated from both sides. The Magnetic Corp., 11785 W. Olympic Blvd., Los Angeles 64, or — **Circle No. S7.**

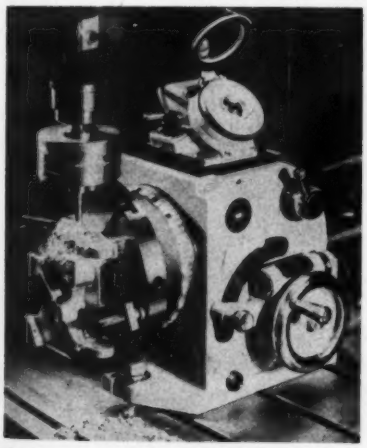
A Quality Control Unit for ultrasonic thickness gaging, recording, and detection of laminar flaws, is the Model R Vidigage. Measure thickness of metals, glass, and plastics between 0.005" and 2.5". The unit has connections for automatic sorting and rejection. Branson Instruments, Inc., 40 Brown House Rd., Stamford, Conn., or — **Circle No. S10.**

A Thickness Gage marked in thousandths of an inch and also in metric equivalents, is the Mastertool No. 722. This tool contains 25 thick-



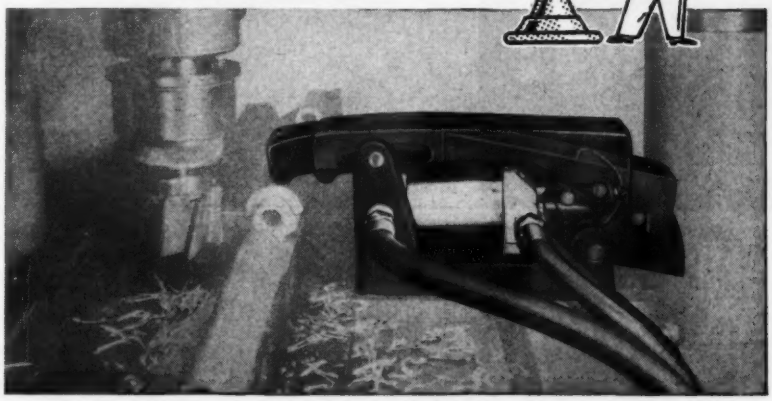
ness blades from 0.0015" through 0.035", and has a wide range of uses for tool and die makers, machinists, and mechanics. Klopp Engineering Inc., 35551 Schoolcraft Rd., Livonia, Mich., or — **Circle No. S8.**

A Dividing Head has an indexing accuracy of better than 10 sec and allows accurate relocating and resetting of points as many times as desired. Direction of spindle rotation can be reversed at any time



during indexing operation without error, and the instrument can be tilted for operation at any angle from −5° to +90°. F. T. Griswold Mfg. Co., 315 W. Lancaster Ave., Wayne, Pa., or — **Circle No. S9.**

STILL ANOTHER LODDING FIRST!



Lodding, Inc. announces a completely automatic clamp (patent pending). This new Lodding production meets the need of the metalworking industry for a compact, automatic and heavy-duty clamp. Air operated and cam locked to hold clamp locked in any event of air failure. Note the compactness (the air cylinder is under the clamp). Delivers ten times line pressure. All wearing parts heat treated. Overall dimensions are 3" wide, 3⅝" high and 8¼" long.

LODDING, INC.
WORCESTER 1, MASS.

Goodwin-Snader Co.
6814 S. Western Ave.
Los Angeles 47, Calif.

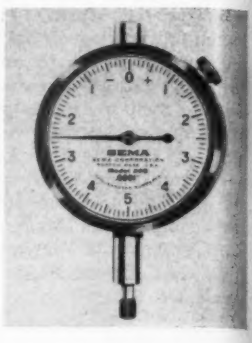
FACTORY WAREHOUSES

Bagby Engineering Co.
1047 Forest Ave.
Evanston, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 153

A Micro-Projector, a self-supporting unit, can be used alongside machine tools or wherever space is a premium. The new Wilder floor Model A-F also has a shelf to hold spare screens or charts and for the laying aside of small parts. Opto-Metric Tool, Inc., 137 Varick St., New York 13, or — **Circle No. S11.**

Interchangeability of Parts to make assembly and upkeep simple are features of the dial indicators made by Sema Corp., P. O. Box 176, Boston 72. This 200 group has a 2¼" dia and is equipped with jewel bearings, but can be supplied with plain bearings when specified. **Circle No. S12.**



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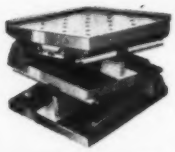
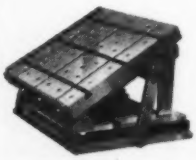
These exclusive new features make Robbins angular tooling equipment *even more* valuable to every shop, large or small: (1) NEW O. S. Walker Multi-Pole Fine Division Permanent Magnet Chuck . . . the most powerful ever built! (2) NEW ribbing in base, intermediate and top plates for distortion-free strength and rigidity! (3) NEW "Perma-Flat" Swivel Block keeps gage blocks securely in place! (4) NEW full-length roll bar radius ground from solid for positive seating, greater accuracy! (5) NEW Robbins positive locking device! Add to these the proven Robbins design principle which makes setting up to machine, grind or inspect any angle a simple, four-step job that takes minutes instead of hours . . . and you see why every shop needs these tools. Free demonstration on your job.



INSPECTION AND LIGHT MACHINING SINE PLATE



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waves in two wave-bands in micro-inches, and the oscilloscope shows the general shape and spacing of the waves in either wave-band. For information, write Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich., or — **Circle Inform-A-Gram No. S13.**

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wide variety of measuring heads can be quickly interchanged without the use of keys or wrenches. Alina Corp., 122 E. 2nd St., Mineola, L. I., N. Y., or—**Circle Inform-A-Gram No. S14.**

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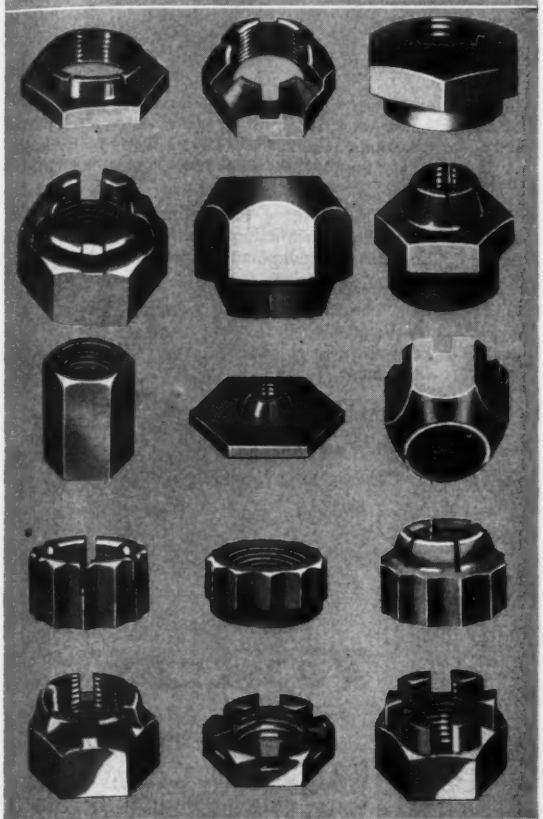
to specs. 7/16"—4 1/4" cross flats

special machines + large stock of material x years of experience = speedy deliveries high quality low prices



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That unexpected, stubbornly-held broken tap can cause exasperating delays in production, add unnecessary cost to the job, and shrink profits.

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The majority of broken taps can easily be removed with Walton's simple, specialized hand tools. No expensive machines needed. Will not damage threads or work.

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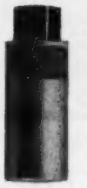

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Primary Stop

KEYSTONE ENGINEERING & MFG. CO.

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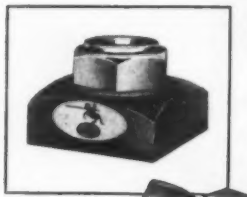

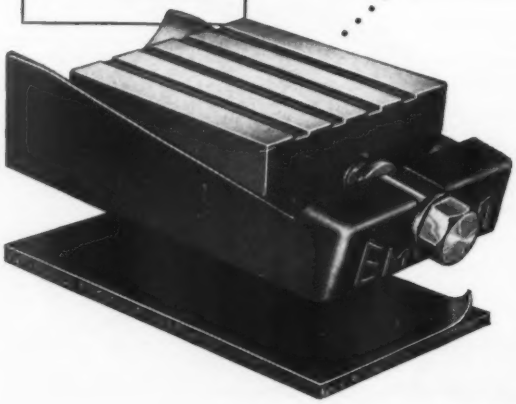

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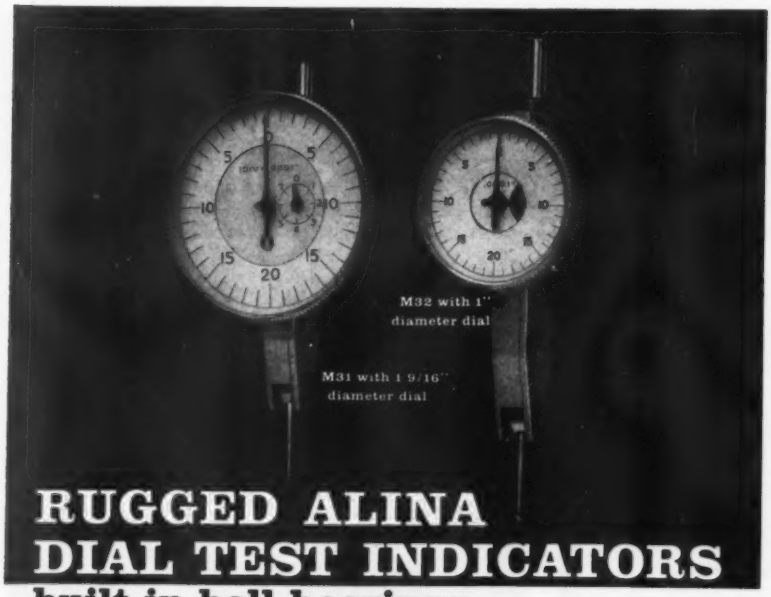

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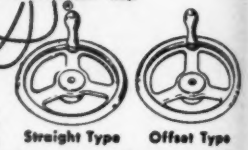

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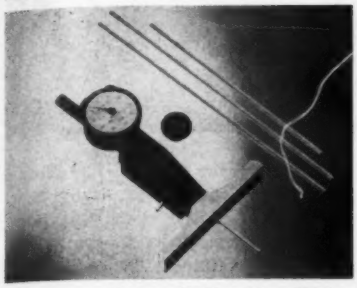
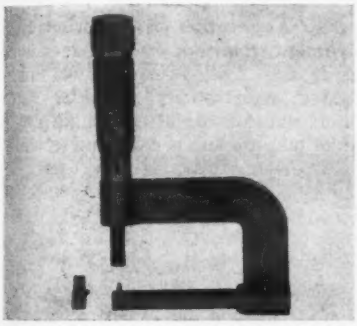
Locate Groove and Measure the Width of a Groove in One Setting with an adjustable depth and groove location gage. The width of the



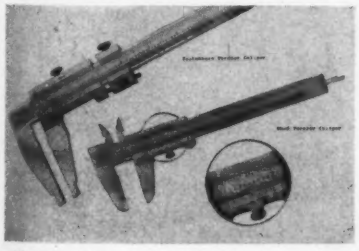
groove can be read directly off the indicator. The anvil is threaded into the gage body, assuring perfect alignment, should be $\frac{13}{16}$" OD or any special base be used. Mueller Laboratory, 1052 N. Allen Ave., Pasadena, Calif. **Circle No. S15.**

An Inner-Groove Micrometer measures and checks the depths of internal O-rings, retaining rings, and recess grooves. Grooves can be measured in bores as small as $\frac{15}{32}$" and to a depth of 2" from the face.



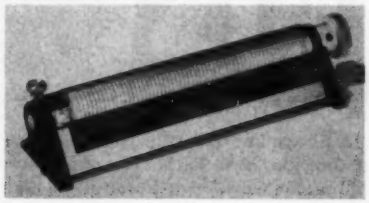
Wall thicknesses of tubing can also be measured with this instrument. Illinois Metal Products, 429 W. Superior St., Chicago 10, or — **Circle Inform-A-Gram No. S16.**

A Lustro-Chrome Stainless Steel Vernier Caliper is easy to read because a double length vernier has been added. The shop vernier caliper is designed for measuring out-



side, inside, and depth dimensions with a measuring capacity of $5\frac{5}{16}$". George Scherr Co., Inc., 200 Lafayette St., New York 12, or — **Circle Inform-A-Gram No. S17.**

Precision Setting of Layout Instruments is possible with the new Micro-Scale. This dimensional standard permits setting dividers and similar tools to 3-place decimal accuracy



without gage blocks or other standards. 6", 12", 18", and 24" models are available. For information, write to Trico Machine Producers Corp., 2664 Grand Ave., Cleveland 4, or—**Circle Inform-A-Gram No. S18.**

THE INFORM-A-GRAM CARD FOLLOWS PAGE 162 IN THIS ISSUE.

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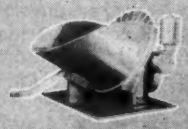

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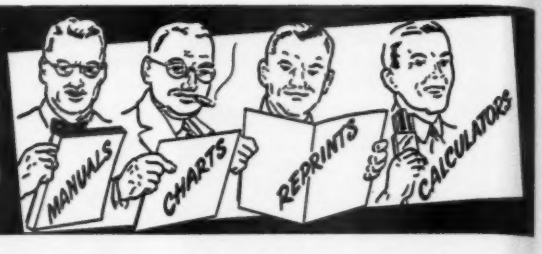

Improve Hack Saw Blade Performance using the blade tensioning chart with two sets of tables. One side gives the correct torque wrench readings in lbs for different machine and blade combinations. The other side shows the new Wachs counted

turn method claimed to be more accurate because friction variables cannot cause false readings and it does not require any special equipment. The E. H. Wachs Co., 1527 N. Dayton St., Chicago 22, or — **No. C1.**

"Titan Alloys" is the title of a booklet which gives detailed chemical, physical, and mechanical properties and specifications of these brass products. Technical data is presented on brass rod, wire, welding rod, hot pressed forgings, and pressure die castings. Direct requests for copies of the booklet to Titan Metal Mfg. Co., Bellefonte, Pa., or — **Circle No. C2.**

"Photodrawings" describes the techniques of using photographs to convey engineering drawing information in an easy-to-visualize form. The booklet discusses two different methods of preparing photodrawings for use in assembly, inspection, and engineering. Information on making the picture negative, equipment and materials needed, making the master photodrawing, direct process reproduction, and other procedures are included. Booklet P-22 is published by Sales Service Div'n, Eastman Kodak Co., Rochester, N. Y., or—**C3.**

A Shock and Heat Resistant Grade of Carbide, V-R 75, is recommended for heavy work in a bulletin. This new grade is available in full length inserts, throwaway inserts, standard blanks, and most styles of standard tools. Bulletin 5712 can be obtained from Vascoloy-Ramet Corp., Waukegan, Ill., or — **Circle No. C4.**

A Method of Finishing and Refinishing Carbide Cutting Tools and Inserts is contained in a booklet. The technique presented is based upon the use of Hyprez diamond compounds with a tool finishing machine equipped with Meehanite lapping wheels that oscillate while they rotate. Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or — **C5.**

A Tungsten-Nickel-Copper Alloy, Heavy Metal is presented in a bulletin which describes shielding, balancing, damping and other applications accompanied by photographs, and includes a purchasing aids section. Specifications are given and an extensive how-to-machine section is included. Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, or — **C6.**

"The Effectiveness of Various Contacting Elements Used for Gaging and Measuring Pitch Diameter" is the title of a bulletin which points out that accurate results depend on the type of contact used. Attached are prints of drawings representing some of the more commonly used contacts in screw thread comparators and gages. Obtain your copy of Bulletin 401 from The Johnson Gage Co., 534 Cottage Grove Rd., Bloomfield, Conn., or — **Circle No. C7.**

"Cold Roll Forming," an 88-page reference manual, tells how to produce a wide variety of metal shapes by this method. Discussions are included on the economics, mechanics, and possible applications of this process to various sized manufacturing operations. A guide to the selection of correct size and capacity of equipment, and instructions on curving, coiling, and other operations are also given. The Yoder Co., 5500 Walworth Ave., Cleveland 2, or — **Circle Inform-A-Gram No. C8.**

"Tool Steel for the Non-Metallurgist" describes the properties and heat treatment of tool steels; length temperature, and hardness conversion tables are included. Crucible Steel Company of America, The Oliver Bldg., Mellon Square, Pittsburgh 22, or—**Circle Inform-A-Gram No. C9.**

Modern Gun Drilling Techniques are discussed in a bulletin which gives the history, application, and performance features of gun type drills. Setup and operating procedures and charts of approximate speeds and feeds and pressure and viscosity are included. Madison Industries Inc., P. O. Box 131, Muskegon, Mich., or — **Circle No. C10.**

The Application of Precision Instrument Bearings is made easier using the "Ball Bearing Yield and System Isoelasticity" booklet. It offers data on radial and axial play, axial take-up and preloading, as well as isoelastic bearings and achievement of system isoelasticity. The booklet is published by The Barden Corp., Danbury, Conn., or — **No. C11.**

A Wall Chart simplifies the selection of ground flat stock available from The DoAll Co., Des Plaines, Ill., More than 1500 standard sizes of tool steel are listed together with useful

analyses, tolerances, and decimal equivalents. The right size will reduce unnecessary machining, save material, and speed up the fabrication of tools and gages. **No. C12.**

Lower Cost · Quicker Delivery

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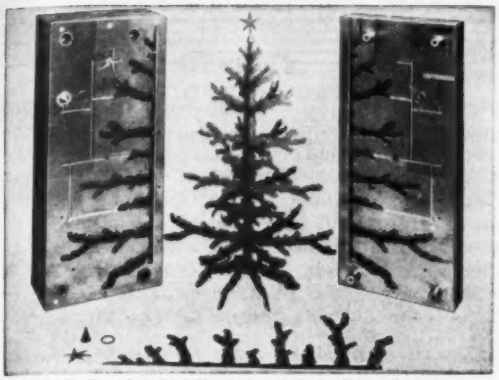

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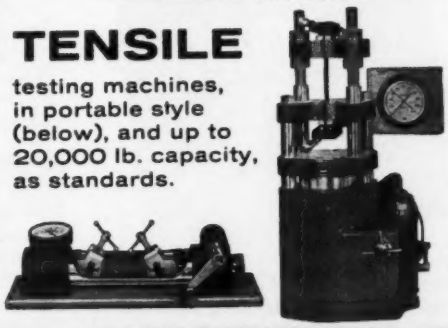

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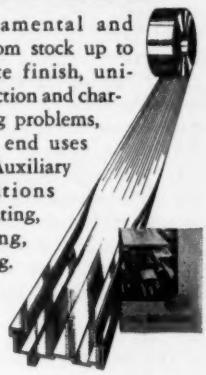

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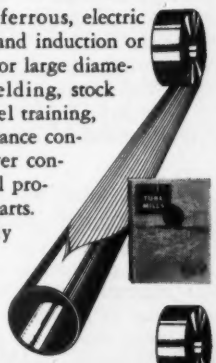

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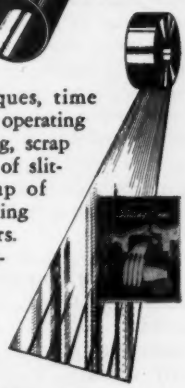

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Circle Inform-A-Gram No. F1.

"The Science of Economical Shelf Storage" explains the different arrangements that can be used for efficient storage of many types of parts or equipment. Advantages of the Rotabin method are listed and specifications are given. Write to The Frick-Gallagher Mfg. Co., 201 S. Michigan Ave., Wellston, Ohio., or
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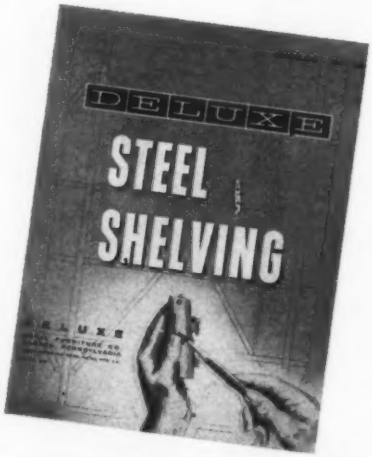
"A Guidebook to a Modern Personnel Program" discusses the new techniques, practices, and procedures used in personnel administration. The manual touches upon 19 different areas or activities which require personnel policies to be established. These include organization of the program, policies on hiring, and how to handle terminations and grievances. Get your copy from Mutual of New York, Dept. 13-6, 1740 Broadway, New York 19, or —
Circle Inform-A-Gram No. F3.

A 10-Key Personal Calculator that adds, subtracts, multiplies, and divides but only weighs 6 lbs, is described in a bulletin. This manually operated machine can be used for calculating percentages, checking extensions, computing interest, billing and invoicing, payrolls, and inventory control. Because the BDC Contex is so small it can be carried in a briefcase for field work and business trips or for work at home. Write to Bonn Duplicator Corp., 444 4th Ave., New York 16, for a copy of the bulletin, or —
Circle Inform-A-Gram No. F4.

Save Time and Manpower on the design of complex cams using the Bendix G-15 general-purpose digital computer described in a bulletin. It explains and illustrates a problem and shows how it was solved with this computer. For more information write Bendix Computer Div'n, Bendix Aviation Corp., 5630 Arbor Vitae St., Los Angeles 45, for your copy of the computer application report, or —
Circle Inform-A-Gram No. F5.

"Application Data for Numerical Positioning Control" describes the functions of numerical positioning control and gives a detailed breakdown of the three major elements — data input, director, and servo drive. This bulletin also provides data accumulated from particular applications on a variety of machines using this type of control. For Bulletin GET-2676, write to General Electric Co., Schenectady 5, N. Y.,
Circle Inform-A-Gram No. F6.

Select Proper Shelving Items for all storage requirements from a catalog which gives suggestions for correct shelving for storing materials, loose and packed parts, books, and record files. Specifications and applications of these items are given and information on shop equipment and storage cabinets is also included. Get Catalog 30 from Deluxe Metal Furniture Co., Warren, Pa., or—**Circle Inform-A-Gram No. F7.**



Eliminate Punching Holes in Blue Prints by storing them in the Glider blue print racks described in a bulletin. Features of the space saving Glider 700 and specifications of the different models available are included. Get the Glider 700 bulletin from Momar Industries, 4323 W. 32nd St., Chicago 23, or —
Circle Inform-A-Gram No. F8.

"New Machines Make New Profits" shows how the extended payment plan makes it possible to buy the latest machine tools and other production equipment. Three separate plans are explained and a sample of how each plan works is presented. For more information about how to keep up with competition, write to Pratt & Whitney Co., Charter Oak Blvd., W. Hartford, Conn., for a copy of this bulletin, or —
Circle Inform-A-Gram No. F9.

A Projector that can produce rapid, sharp, and distortion-free enlargements of microfilm negatives on diazo paper is announced by Keuffel & Esser, 260 Madison Ave., New York 16, N. Y. Units for the 8½" x 11" or 18" x 24" sizes will be available. Because diazo paper is used, it is a low cost method of reproduction. Obtain more information from the company, or —
Circle Inform-A-Gram No. F10.

New Techniques Information for the reproduction of microfilm in card apertures containing pre-mounted negative or positive film is available from The Filmsort Co., Pearl River, N. Y. The UNIprinter duplicates microfilmed records in less than a minute with ordinary room lighting. The aperture cards are used for microfilmed engineering drawings. Write to the company for more information, or —
Circle Inform-A-Gram No. F11.

"Fire Protection Service Plan" shows how a company can do a complete job of protecting itself against damaging fire loss. The booklet explains services which include an in-plant fire protection survey, visual aids for training meetings, and fire control training and demonstrations. For a copy, write to Ansul Chemical Co., Marinette, Wis. **Circle Inform-A-Gram No. F12.**

LIFTING DEVICES

for FAST • SAFE • BETTER Material Handling of • SHEETS • COILS • BOXES • MOLDS • DRUMS • PALLETS • 400 MODELS

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DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS
Wilmerding, Penna.

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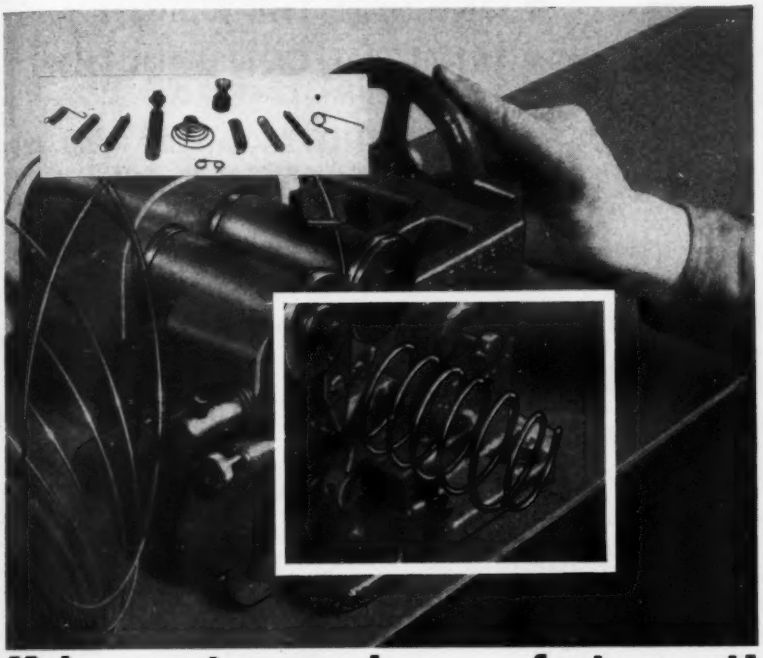
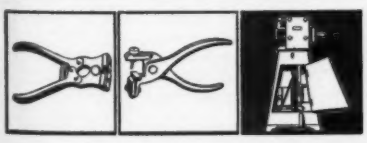


Make any type spring . . . fast, exact!

WITHOUT USE OF ARBORS

For a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005″ to .125″, you can produce it in a matter of seconds with Perkins Precision Spring Coiler. You eliminate arbors, yet turn out precision springs — torsion, compression, extension, tapered, or special springs, coiled either left or right hand, in any desired length, any diameter from 3/32″ to 12″ and larger, with or without initial tension, and with open or closed ends. Eliminate expensive special orders and costly production delays! Make your own springs to exact specifications as replacements or experimental work. Make them fast, right in your own shop!



Starret adjustable jaw cut nippers (left) and Gardener Hook-Kon spring looping tool (center) — handy, precision, time-saving accessories for spring coiling. Perkins Spring Coiler available as bench model or power model shown here, (right) for tool shop or continuous runs.

PERKINS
MACHINE AND GEAR CO.
Special Machinery Division, West Springfield, Mass.

Perkins Machine and Gear Co.
Special Machinery Division, Dept. B1
W. Springfield, Mass.
Please send information and prices on Perkins Spring Coiler.
Hand Model ☐ Power Model ☐

Name.....Title.....
Company.....
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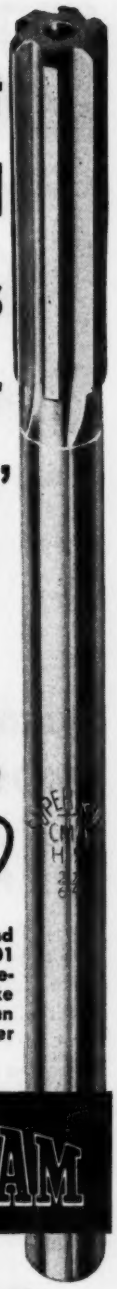
CIRCLE INFORM-A-GRAM KEY NO. 1613

What other tool companies consider "SPECIALS"

(IN DECIMAL SIZES)

... WE STOCK AS STANDARD



Thousands of chucking and Stub Reamers by the .001 in Stock ready for the precise job. Why buy or make "SPECIALS" when you can BUY from STOCK — over night.

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TWENTIETH CENTURY MANUFACTURING COMPANY
BOX 429-TP
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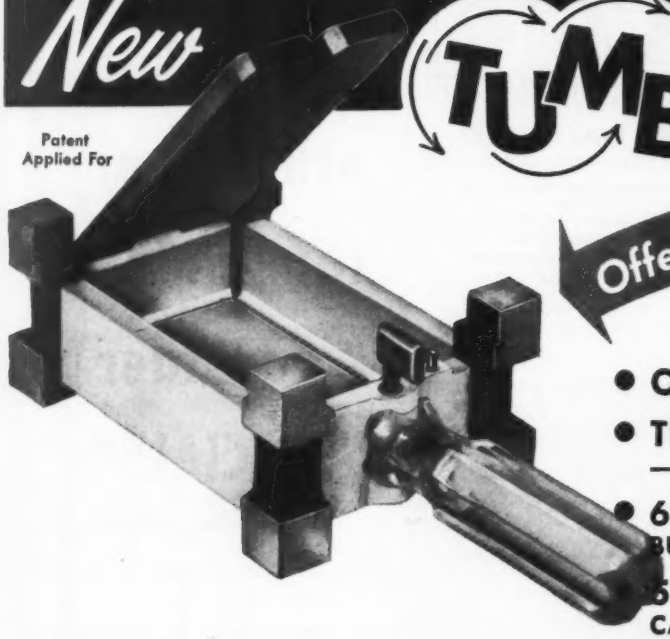
CIRCLE INFORM-A-GRAM KEY NO. 1614

New TUMBLE BOX JIG

Patent Applied For



Offers Many Big Advantages

AVAILABLE IN 47 SIZES

- ONE-HALF THE WEIGHT
- TRI-METAL CONSTRUCTION —ALUMINUM—CAST IRON—STEEL
- 6-SIDE UTILITY—CAN USE HEAD-TYPE BUSHINGS, ON SIDES, TOP, BOTTOM
- 6 HANDLE LOCATIONS—HANDLE CAN BE ATTACHED TO ANY SIDE OR BOTTOM
- ONE HAND OPERATION—THUMB SCREW RELEASES LID INSTANTLY
- LEAF "POP-UP"—AUTOMATIC ACTION SPRING PLUNGER SNAPS LID OPEN
- STABLE—RUGGED CONSTRUCTION

Standard Parts is First with Exclusive New "TUMBLE" Jig

Light Weight and Ease of Handling Boost Production, Cut Operator Fatigue

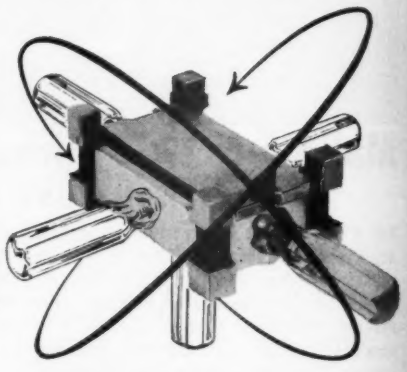
New design features, new engineering concepts, new construction techniques . . . . are incorporated in this outstanding line of "Tumble" Box Jigs. By combining 3 metals—aluminum, cast iron, steel—half the weight has been eliminated. This increases efficiency and production. The sturdy handle (can be located on any side) makes tumbling fast, easy and safe.

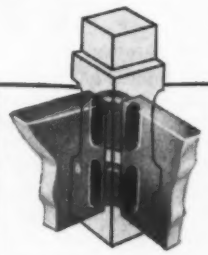
Bushings can be used on all 6 sides. A unique interlocking feature is the aluminum through the cast iron legs, which assures strength and stability. Walls can easily be machined without distorting the Jig. 47 Sizes available 1" x 1" x 1" to 4" x 8" x 4".

Full size Tracing Templates are available for all 47 sizes.

HANDLE (as illustrated) may easily be attached on any side or bottom of the jig as needed.

TUMBLE—Universal tumble direction (as illustrated) is advantage of this lightweight jig — where handle can be located where desired.





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Aluminum goes all the way through the cored slots in the cast iron legs—forms a unified, interlocking joint — assuring light weight, but rugged strength.

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5	23	41	84	107	139	902	1162	1304	1421	1496	1614
6	24	42	85	108	140	903	1163	1305	1422	1511	1641
7	25	43	86	109	143	1041	1191	1321	1423	1512	1642
8	26	44	87	111	144	1042	1192	1322	1424	1513	1643
9	27	45	88	113	147	1043	1193	1323	1451	1521	1644
10	28	46	89	114	148	1044	1201	1381	1452	1522	1651
11	29	47	90	117	153	1045	1202	1382	1453	1523	1652
12	30	48	91	119	154	1101	1203	1383	1454	1561	1661
13	31	60	93	121	157	1102	1241	1371	1461	1562	1671
14	32	71	95	122	162	1103	1242	1372	1462	1563	1672
15	33	73	96	125	163	1104	1243	1373	1463	1561	1673
16	34	75	97	127	171	1105	1261	1381	1464	1562	1701
17	35	77	99	128	172	1106	1262	1382	1465	1563	1702
18	36	79	101	129	801	1121	1263	1383	1491	1581	1703
19	37	79	102	131	802	1122	1264	1384	1492	1582	1704

EDITORIAL ITEMS

A1	A19	A37	A55	A73	A91	B18	B34	B52	D0	S0
A2	A20	A38	A56	A74	A92	B17	B35	B53	F1	S7
A3	A21	A39	A57	A75	A93	B18	B36	B54	F2	S8
A4	A22	A40	A58	A76	B1	B19	B37	B55	F3	S9
A5	A23	A41	A59	A77	B2	B20	B38	C1	F4	S10
A6	A24	A42	A60	A78	B3	B21	B39	C2	F5	S11
A7	A25	A43	A61	A79	B4	B22	B40	C3	F6	S12
A8	A26	A44	A62	A80	B5	B23	B41	C4	F7	S13
A9	A27	A45	A63	A81	B6	B24	B42	C5	F8	S14
A10	A28	A46	A64	A82	B7	B25	B43	C6	F9	S15
A11	A29	A47	A65	A83	B8	B26	B44	C7	F10	S16
A12	A30	A48	A66	A84	B9	B27	B45	C8	F11	S17
A13	A31	A49	A67	A85	B10	B28	B46	C9	F12	S18
A14	A32	A50	A68	A86	B11	B29	B47	C10	S1	
A15	A33	A51	A69	A87	B12	B30	B48	C11	S2	
A16	A34	A52	A70	A88	B13	B31	B49	C12	S3	
A17	A35	A53	A71	A89	B14	B32	B50	D1	S4	
A18	A36	A54	A72	A90	B15	B33	B51	D2	S5	

Which article in this issue was of most interest to you? _____

THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

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A4	A22	A40	A58	A76	B1	B19	B37	B55	F3	S9
A5	A23	A41	A59	A77	B2	B20	B38	C1	F4	S10
A6	A24	A42	A60	A78	B3	B21	B39	C2	F5	S11
A7	A25	A43	A61	A79	B4	B22	B40	C3	F6	S12
A8	A26	A44	A62	A80	B5	B23	B41	C4	F7	S13
A9	A27	A45	A63	A81	B6	B24	B42	C5	F8	S14
A10	A28	A46	A64	A82	B7	B25	B43	C6	F9	S15
A11	A29	A47	A65	A83	B8	B26	B44	C7	F10	S16
A12	A30	A48	A66	A84	B9	B27	B45	C8	F11	S17
A13	A31	A49	A67	A85	B10	B28	B46	C9	F12	S18
A14	A32	A50	A68	A86	B11	B29	B47	C10	S1	
A15	A33	A51	A69	A87	B12	B30	B48	C11	S2	
A16	A34	A52	A70	A88	B13	B31	B49	C12	S3	
A17	A35	A53	A71	A89	B14	B32	B50	D1	S4	
A18	A36	A54	A72	A90	B15	B33	B51	D2	S5	

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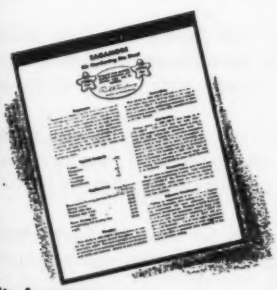

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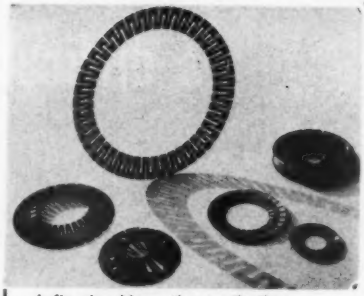

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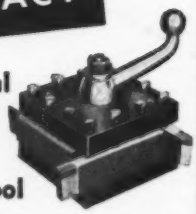

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ENCO TOOL POST TURRETS

Boost lathe production, cut costs, reduce tool switching and re-checking, cut set-up time, with ENCO 12-station tool post turrets! Holds 4 maximum size tools . . . . 3 working positions each. Sturdy and rigid for hogging cuts, yet unsurpassed for close-tolerance work.

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Spring loaded balls locked between perfectly milled spherical seats provide consistent re-indexing accuracy. "On the ball" every time!

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Please send catalog #53 and full details of ENCO 12-station tool post turrets.

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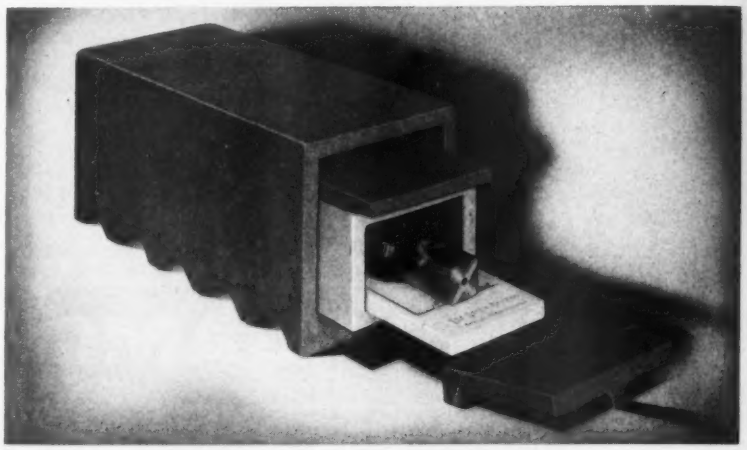

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THE SENTRY DIAMOND BLOCK

The truly neutral atmosphere produced by the Sentry Diamond Block unfailingly prevents scale or decarburization on all types of high-carbon high chrome or tungsten, molybdenum or cobalt high speed steels at hardening temperatures.

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Sentry Model "Y" Furnaces, designed especially for use with Sentry Diamond Blocks, provide the ultimate in high speed heat treating equipment at amazingly low cost.

Send samples of your high speed steel tools for free demonstration hardening, and/or write for the Sentry catalog for further details.

185-B

Sentry TRADEMARK **ELECTRIC FURNACES**

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NO TANGLE NOTCH COIL BRAZING RINGS

No Waste of Precious Alloy

Preformed *No Tangle Notch Coil Rings* end wasted time in placing silver solder in position for brazing operations. Rings fit quickly and accurately on parts to be joined. Cut and try methods and resulting rejects are eliminated. Silver solder is actually metered to flow evenly into and around joints.

★ Quickly snapped off coil and placed on part.

★ No tangling or distortion in handling.

★ Minimum amount of precious alloy needed to obtain positive bond.

RING DIAMETERS from ¼" to 12" — + .001.

WIRE SIZES .020 to .093.

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16 page booklet gives you all the facts on better brazing with preforms. Write Today!

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CIRCLE INFORM-A-GRAM KEY NO. 1651

TEAM EFFORT MAKES OXIDE GUN DRILLS

It is economically possible to fabricate cemented oxide gun drills, engineering teams of Hyper Tool Company and the Metallurgical Products Department of General Electric Company, have proved in recent tests. They did not attempt to evaluate the performance of the cemented oxides in comparison to conventional gun drill materials, but they did release this much information:

The center-cut gun drills of 0.625" and 1" dia are designed with the cemented oxide bolted to the steel shank. This is a safety factor because the oxide is difficult to braze. A standard socket screw in a counterbored hole in the oxide holds the cutting tip in place. The Carboloy cemented oxide fits into a 60° included angle truncated "V" notch. This relatively small "V" angle was chosen to give longer sides to the "V" and a corresponding longer bearing surface upon which to distribute the cutting forces from the oxide to steel shank.

The drills developed by the team effort are equipped with two oil holes rather than one, to insure that chips will be removed rapidly from the cutting edge and to prevent possible chip buildup and tip breakage.

The oxide they used was preformed to shape. The center groove, oil holes, and the hole for attaching the bolt already were formed in the piece when received by Hyper Tool Company. They ground the cutting edge contour and finish-ground to tolerances, using a 180-grit resinoid bonded diamond for rough-grind and a 600-grit resinoid bonded diamond wheel for finish grind. The tolerance on the oxide diameter of the drill was held to within +0.000 −0.0002".

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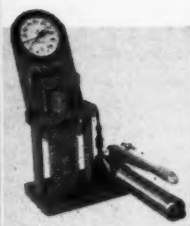

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This cumulative index will build up progressively during each calendar year. Each issue will carry a cumulative index of material contained in all previous issues of the same year, with each January issue carrying the complete index of the twelve issues of the previous year.

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The Publisher

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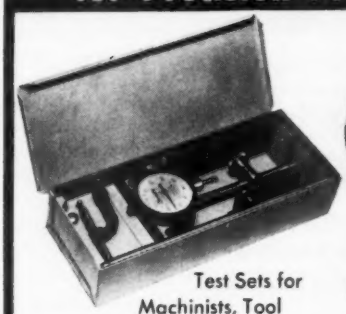

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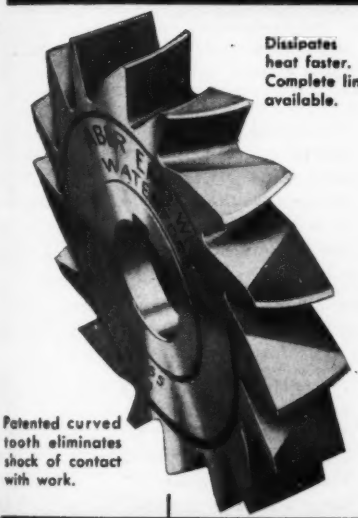

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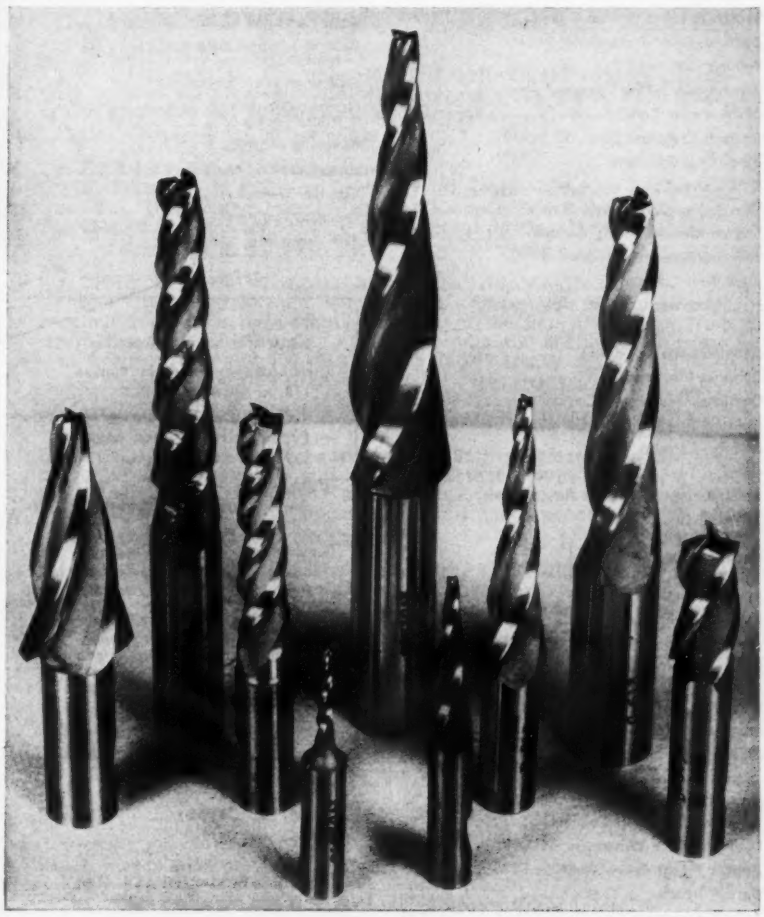

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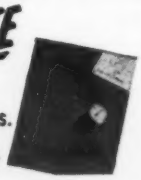

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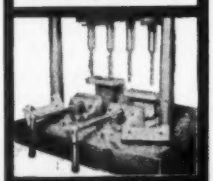

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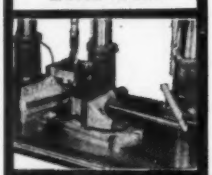

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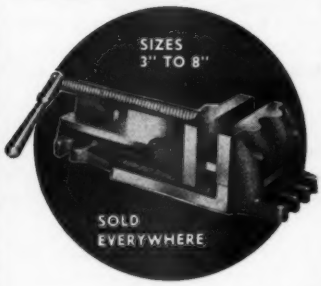

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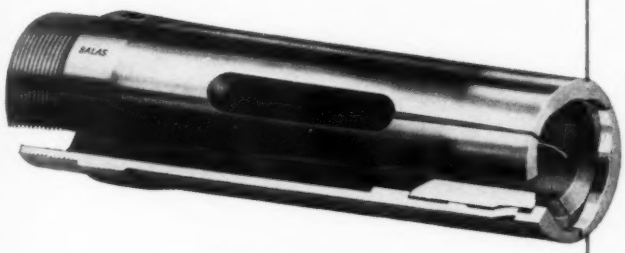

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